GEOGRAPHY OF THE KENTUCKY MOUNTAINS

DARRELL HAUG DAVIS

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WILLARD ROUSE JILLSON
DIRECTOR AND STATE GEOLOGIST

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Geography of the Mountains of Eastern Kentucky

1924

PHOTO BY W. R. JILLSON

MEETING OF THE OHIO AND BIG SANDY RIVERS.

This tip of northeastern Kentucky is destined to enjoy a great industrial future. Combining the best facilities offered by through water and rail transportation the Russell-Ashland-Catlettsburg district is the logical point for many large manufacturing enterprises. Ashland with its rapidly expanding industrial population stands at the northern gateway to the rich coal, oil, gas and stone resources of the mountains of Eastern Kentucky. In this view the Ohio River is flowing to the left. The Reader is in Boyd County, Kentucky. On the left across the river is Ohio, and on the right connected by the Norfolk and Western Railroad bridge is West Virginia.

The GEOGRAPHY OF THE MOUNTAINS *of* EASTERN KENTUCKY

A Reconnaissance Study of the Distribution and Activities of Man in that Part of the Cumberland Plateau Embraced by the Commonwealth.

BY

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Illustrated by Eighty Photographs Maps and Diagrams

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Contents

Contents v

List of Illustrations vii

Preface ix

PART I. SPACE RELATIONSHIPS, PHYSICAL CHARACTERISTICS AND SUBDIVISIONS OF THE KENTUCKY MOUNTAINS.

Chapter — Page

I. INTRODUCTION 2
- Space Relationships
- Physical Features

II. SUBDIVISIONS OF THE KENTUCKY MOUNTAINS 13
- Basis for Subdivision
- Ridge Top and Limestone Valley Settlements of the Western Border
- Creek Bottom Settlements

PART II. ECONOMIC CONDITIONS

III. THE LAND AND ITS USES 31
- Unimproved Land
  - Drainage
  - Timber and its Uses
  - Scenic Value of Forests
- Improved Land
- Farms
- Crop Production
  - Cereals
  - Hay and Forage Crops
  - Vegetables and Miscellaneous Crops
  - Fruits and Nuts
  - Animals and Animal Products

IV. LIVING CONDITIONS IN THE RURAL DISTRICTS AND MINING COMMUNITIES 85
- Rural Districts
- Mining Communities
- Ownership of the Land

V. HIGHWAYS AND TRANSPORTATION 103
- Roads
- River Navigation
- Railroads

VI. MINERAL WEALTH AND THE MINERAL INDUSTRIES 121
- Coal and Coal Mining
- Oil and the Oil Fields
- Natural Gas
- Bituminous Sandstones
- Clays and Clay Manufactures
- Sands
- Iron Ores
- Water

Chapter		Page
VII.	CITIES AND MANUFACTURES	139
	City Location and City Plan	
	Classes of Cities	
	City Growth	
	Ashland and Catlettsburg	
	Middlesboro	
	Hazard	
	Jenkins	
	Corbin	
	Pineville	
	Harlan	
	Minor Centers of Population	
	Future Urban Development	
VIII.	POPULATION AND WEALTH	152
	Population	
	Wealth	
	CONCLUSION	165
	BIBLIOGRAPHY	173
	INDEX	179

Illustrations

		Page
Frontispiece—Meeting of the Ohio and Big Sandy Rivers.		
Fig. 1.	Sections to show geological structure	9
Fig. 2.	Sub-regions of the Kentucky Mountains	14
Fig. 3.	Topography of the western border of the Mountains	15
Fig. 4.	Topography of the area of ridge top settlements	18
Fig. 5.	Topography of the area of creek bottom settlements	22
Fig. 6.	Percentage of land area in farms	48
Fig. 7.	Average size of farms in acres	53
Fig. 8.	Improved land in farms	55
Fig. 9.	Average land values per acre	59
Fig. 10.	Distribution of corn and county yields in bushels	67
Fig. 11.	Distribution of oats and county yields in bushels	71
Fig. 12.	Distribution of cattle	80
Fig. 13.	Distribution of hogs	81
Fig. 14.	Projected primary highway system	109
Fig. 15.	Railroad lines and their relation to coal mines	115
Fig. 16.	Growth of railroad lines by decades, 1885-1905	119
Fig. 17.	Distribution of the clay industries	133
Fig. 18.	Density of population. (Total population)	154
Fig. 19.	Density of population. (Rural population)	155
Fig. 20.	Per cent of increase or decrease of total population	156
Fig. 21.	Per cent of increase or decrease of rural population	157
Plate 1.	The Valley of Block Creek, Wolfe County	16
Plate 2.	The Natural Bridge at Natural Bridge	17
Plate 3.	Cumberland Falls	19
Plate 4.	Characteristic tree growth on the ridges	20
Plate 5.	Ridge farm in Whitley County	20
Plate 6.	Valley farms of the western margin	21
Plate 7.	A slope cultivated to the top of the ridge	23
Plate 8.	A "Perpendicular" cornfield in central Breathitt County	24
Plate 9.	A typical road up one of the smaller creeks	24
Plate 10.	A typical single room log house	25
Plate 11.	A double room log house with center hall	26
Plate 12.	A typical frame house	26
Plate 13.	Raft of logs tied up to the shore	40
Plate 14.	Sawmill at Quicksand	41
Plate 15.	Small portable mill in operation	42
Plate 16.	Clearing a steep slope preparatory to temporary use	54
Plate 17.	Corn on a creek bottom and on the adjoining steep slopes	63
Plate 18.	Corn in a "deadening"	64
Plate 19.	Corn bladed and leaves stacked for fodder	65
Plate 20.	A sorghum mill in operation	74
Plate 21.	View across the valley of one of the Forks of Greasy Creek	75
Plate 22.	Pasture on bottom land	79
Plate 23.	Mountain home showing a typical chimney of sandstone slabs	86
Plate 24.	A typical small farm at the head of a cove	87
Plate 25.	Rock house in use as a stable	88
Plate 26.	Washing clothes by the side of a branch	89
Plate 27.	"Aunt" Emily Vanover	89
Plate 28.	Bringing in the mail to Stevenson	90
Plate 29.	Old mill on Eagle Creek, McCreary County	91
Plate 30.	Pine Mountain Settlement School	93

		Page
Plate 31.	Miners' homes and farms	94
Plate 32.	Miners' houses scattered on the slopes adjoining the creek	95
Plate 33.	A typical street in one of the smaller mining camps	96
Plate 34.	House and cornfield on the bottoms of Looney Creek	98
Plate 35.	Paved street and miners' home at Lynch	99
Plate 36.	A view on the "Wilderness Road"	103
Plate 37.	An improved road crossing the "Mountains"	104
Plate 38.	Road on a bench blasted out of the slope	105
Plate 39.	A ridge top road in Whitley County	106
Plate 40.	Fording the Cumberland River	107
Plate 41.	A mountain road in the spring	108
Plate 42.	Barges and typical stern wheel freight and tow boat	110
Plate 43.	Towing a raft of logs down stream	111
Plate 44.	Coal mine and barges loading with coal	112
Plate 45.	Ohio River packet tied up at the floating dock at Ashland	113
Plate 46.	A typical "farmer digging"	125
Plate 47.	A tpyical tipple	126
Plate 48.	The million dollar tipple at Lynch	126
Plate 49.	Drilling for oil	128
Plate 50.	Pumping oil from a well near Irvine	129
Plate 51.	View of Louisville Fire Brick Works, Grahn, Carter County, Kentucky	134
Plate 52.	Steel mill at Ashland	144
Plate 53.	The business district of Ashland	145
Plate 54.	The main business street of Middlesboro	146
Plate 55.	A residence street in Middlesboro	147
Plate 56.	A view of the business section of Hazard	148
Plate 57.	The hotel at Pineville	149
Plate 58.	A view of Jackson, the county seat of Breathitt county	151

Preface

The purposes of this geographic reconnaissance study of the Kentucky Mountains are to describe and explain existing conditions of human occupation in terms of regional opportunity or handicap wherever possible, to differentiate between the various portions of the area on the basis of differences in physical equipment and variations in response, and to indicate the opportunities for advantageous future development.

The subject is treated in two parts. Part One consists of a definition of the area and a general discussion of its space relationships and physical characteristics. This is followed by a division of the entire region into sub-regions which possess greater geographic unity. It is not the aim in this section to discuss in full the physical equipment of either the entire area or any of the sub-regions. Individual factors of the environment are not treated exhaustively or on their own account; environmental factors, both individually and collectively, are discussed only as they set the region apart from surrounding areas or as they lead to a differentiation of opportunity in the various sub-regions of the area under consideration.

Part Two is a survey of present-day economic conditions, together with an explanation of such conditions, with particular reference to the opportunities afforded by the environment and the local handicaps. In cases where present-day conditions represent a survival of institutions which have no actual explanation in the present, a limited historical background is introduced to account for the existing condition. As the Kentucky Mountains, in common with many other areas of similar topography, have served to isolate the inhabitants and retard development and progress, such adjustments to a past period exist in considerable numbers, though this is true in decreasing measure from year to year.

In Part Two, the use of the land, conditions of life in the rural districts and mining centers, highways and transportation, scenic assets, mineral resources, and urban development are discussed. Consideration is also given to an analysis of the changes in number, distribution and character of the population for several decades, and the significance of such changes, together with a general survey of the distribution and increase of wealth.

In the explanation of existing economic conditions, climate, soils, topography and other environmental factors are taken into

account wherever necessary, though no formal discussion of these on their own account is attempted. A deliberate selection is made of geographically significant phases of each which determines the limits of the discussion.

Such a study points the way for a summary of the problems of the area and some possible solutions. Both assets and handicaps are enumerated and present trends as well as future possibilities are indicated.

Although the Kentucky Mountains constitute only a fraction of a larger geographic unit which embraces portions of several states, and although the boundaries of the area are in part artificial, the region is so sharply set off from the balance of the state that in such a study as is now being made of the State of Kentucky the "Mountains" constitute a distinct geographic unit. This is an area in which change is occurring with great rapidity as previously dormant factors of the environment alter in relative value under changing conditions. The region is a very suitable choice for the second geographic study to be undertaken under the auspices of the Kentucky State Geological Survey.

The field work necessary for this report was done during the summer of 1922. Due to the size of the area involved and the difficulties attendant on travel, the time was inadequate to make a detailed study. This geographic reconnaissance might well be followed by more intensive studies of the sub-regions which are indicated by the reconnaissance work.

In the prosecution of the work, assistance was afforded by many different individuals so that the field work was facilitated greatly. It is impracticable to name separately the different persons who contributed to the success of the undertaking, but the writer wishes to express his obligation to all who were of assistance and to acknowledge the unfailing courtesy and helpfulness of the people of the Kentucky Mountains. Special acknowledgment should be accorded to Dr. W. R. Jillson, Director and State Geologist, for his initiation of this series of geographic studies, which place the State of Kentucky well in the van in such work in the United States, and for his generous and effective cooperation in the furtherance of the work.

Angust 1, 1924
Minneapolis, Minn.

D. H. DAVIS
Geographer

THE GEOGRAPHY *of the* MOUNTAINS OF EASTERN KENTUCKY

PART I

SPACE RELATIONSHIPS, PHYSICAL CHARACTERISTICS AND SUBDIVISIONS OF THE KENTUCKY MOUNTAINS

CHAPTER I

INTRODUCTION.

"The Kentucky Mountains."

The Kentucky portion of the Cumberland Plateau is commonly known as the "Kentucky Mountains" because of the rugged and mountainous character of the topography. This portion of the plateau is maturely stream dissected, a maze of winding ridges, separated by narrow, steep-sided valleys. It is to the ridges that the inhabitants and writers refer as "mountains." Two true mountains occur in the area, Pine Mountain and Cumberland Mountain, but even these are overtopped by many of the higher ridges which are the result of erosional processes rather than elevation.

Space Relationships.

The Kentucky Mountains embrace all of Kentucky east of a line drawn from Portsmouth on the Ohio River to the southwest corner of Wayne County, an area of 10,450 square miles,[1] or approximately 25% of the total area of the state. Only on the south is the boundary an arbitrary line. To the north and northeast, rivers, which also serve as political boundaries, limit the area; to the east and southeast, topographic barriers mark the limits; and to the west, the rugged westward fronting escarpment of the conglomerate sandstone margin of the Eastern Carboniferous Plateau separates the area from the region to the west.

Kentucky was originally a part of the county of Fincastle, Virginia. In 1776, by subdivision, Kentucky County was separated and its eastern boundary established essentially as today "beginning at the Ohio, at the mouth of Great Sandy Creek, and running up the same and the main or northeasterly branch[2] thereof to the Great Laurel Ridge or Cumberland Mountain; thence southwesterly along the said mountain to the line of North Carolina."[3] When Kentucky was admitted to the Union in 1792, the commission appointed to establish the Virginia-Kentucky boundary located it somewhat more accurately,[4] and since 1799-1800, this line has been the boundary between Kentucky and the states to the east.

The southern boundary is the westward extension of the old Virginia-North Carolina boundary, the so-called "Walker Line."[6] This line departs somewhat from the parallel of 36° 30″ which it was supposed to follow because of the difficulty of accurate survey in the wilderness and the impossibility of making corrections for magnetic variation at the early date at which the survey was made.

The Ohio River was established as the northern boundary in 1784 when Virginia relinquished her claim to territory north of the Ohio River,[8] the boundary line following low water on the right bank of the river, as Virginia retained control of the river by the cession of 1784.[7]

The western boundary of the area is an extremely irregular line, deeply indented wherever the rivers have trenched extensively the formations of the Eastern Carboniferous Plateau. It is, nevertheless, a definite line, marking off sharply the "Mountains" from the area to the west.

The Kentucky Mountains have always possessed a peripheral location with reference to land and water highways which has rendered them difficult of access. Until the last decade of the eighteenth century, there was no settlement in the Mountains. This region formed an island of unoccupied land viewed by most of the immigrants only as a barrier to be passed on the way to the west. The early sparse population later, by continued isolation, became a distinct group of people possessing the speech, customs and manner of life of a bygone day in their "refuge" area.

The most important of the early overland roads by which population moved into Kentucky was the "Wilderness Road," by way of Cumberland Gap and the break in Pine Mountain at Pineville, where the Cumberland River cuts through. This route was more popular than the shorter but rougher northern roads because it afforded greater ease of travel.[9] The southern route was also less exposed to the danger of Indian attack than the northern roads or the route down the Ohio River.[10] The Wilderness Road, which skirts the southern portion of the Kentucky Mountains, therefore served as the principal highway over which poured the early flood of settlement into the agriculturally more desirable areas to the west. From this incoming tide of population, a few settlers detached themselves and occupied the more desirable and larger creek bottoms, but the majority pushed on, as the area in general did not appeal to them.* The northern portion of the Kentucky Mountains was also settled slowly. Not until 1807 was Catlettsburg founded,[11] although prior to that time there had been some settlement in the upper portion of the Big Sandy Valley.[12] The larger number of settlers moving down the Ohio River and coming in by the northern overland routes passed by the eastern portion of Kentucky as did those coming in by the southern route. Though girt by roads leading to the west, early settlement in the Mountains was sparse and casual in character. The settlers represented, in large part, those who dropped out on their way to areas farther to the west. This early unattractiveness of the area is also shown by the slowness of the organization of counties. (See page 7.)

At a later date, when the wave of transmontane immigration had spent itself, settlement pushed in from the west,[13] but here, also, penetration of the mountains was difficult. Only where the rivers had frayed the west fronting conglomerate escarpment was access possible. Until late in the history of the state, no railroad penetrated this western barrier (See Fig. 16), and wagon roads east of it were, almost without exception, poor. Even today, railroads and roads enter only where main drainage lines have breached the barrier. As a consequence of topographic conditions, at both an early and a late date movement into and through the Mountains has been difficult and communication with the outside world has been hampered. This peripheral location with reference to highways, both land and water, has been in large part the cause of the retardation which is today disappearing so rapidly since the advent of the railroad and the improvement of the wagon roads.

Kentucky was included in the original limits of Virginia as a portion of the County of Orange which was formed in

*William Brown's itinerary of his trip in 1782 from Hanover, Virginia, to Harrodsburg, Kentucky, gives the following account of the country as regards desirability for settlement: "Cumberland Mountain appears to be a very high ridge of white rock, inaccessible in most places to either man or beast, . . . The way through the gap is not difficult . . . From thence until you pass Rockcastle River, there is little good road; this tract of country is very mountainous . . . There is some good land on the water courses . . . After you cross Rockcastle, there are a few high hills . . . ; the land appears to be rather weak." Speed, Thomas: The Wilderness Road. Filson Club Publication No. 2, pp. 19-20, 1886.

1734.[14] In 1738, Augusta was created from a portion of Orange County; in 1769, Boutetourt from Augusta; in 1772, Fincastle from Boutetourt; in 1776, Kentucky from Fincastle.[15] With the increase in population which had occurred by 1792, when Kentucky became a state, nine counties were formed, the Mountains forming the eastern extremity of four of these counties: Lincoln (1780), Bourbon and Madison (1785), and Mason (1788). None of these counties was wholly in the Mountains and the county seats were all located in the Blue Grass.[16] Thereafter, subdivision progressed rapidly. The origin of the present counties which lie partly or wholly in the Mountains is shown in the tabulation on p. 7. Between 1850 and 1870, there was a gradual separation of the mountain counties from those in the Blue Grass, and since 1870, with the exception of the western border counties, the separation is complete.

By continued and excessive subdivision, the counties of this portion of Kentucky have become much too small for economical and efficient administration. The mountain counties slightly exceed the state average in size, but this is due to the fact that several large counties, such as Pike County, the largest in the state, bring up the average. There are several counties as Boyd, Lee, Menifee, Owsley and Powell, which are manifestly too small, these being among the twenty-five smallest counties in Kentucky, a state of small counties. In a section such as the Kentucky Mountains, where topographic conditions render much of the land unavailable for agriculture, where general standards of living are low, and where the burden of taxation rests heavily on the agricultural population without having it unnecessarily increased by a wasteful duplication of the administrative expense, the too small county is particularly unfortunate.

Although subdivision of several of the larger counties may occur in the future, nearly two-thirds of the mountain counties would seem to be removed from all possibility of further reduction in size. The first counties in a sparsely settled community are logically large counties. Unless there is a great increase in wealth and density of population, there is no occasion for subdivision into smaller areas. No warrant for such subdivision exists in the Kentucky Mountains. A readjustment of county lines

and an increase in the size of the counties is highly to be desired as it should lead to an increase in the efficiency and a decrease in the expense of administration.

THE MOUNTAINS OF EASTERN KENTUCKY

Name of County	Date of Formation	Counties From Which Formed	Area of Present County in Sq. Mi.	Rank in Size in State
Pulaski	1798	Lincoln, Green	628	4
Knox	1799	Lincoln	356	47
Floyd	1799	Fleming, Montgomery, Mason	399	35
Wayne	1800	Pulaski, Cumberland	478	18
Greenup	1803	Mason	346	50
Clay	1806	Madison, Knox, Floyd	478	15
Estill	1808	Madison, Clark	254	84
Rockcastle	1810	Lincoln, Pulaski, Madison, Knox	310	62
Whitley	1818	Knox	442	22
Harlan	1819	Floyd, Knox	478	17
Perry	1820	Floyd, Clay	335	54
Pike	1821	Floyd	779	1
Lawrence	1821	Greenup, Floyd	422	28
Morgan	1822	Floyd, Bath	365	46
Laurel	1825	Rockcastle, Clay, Knox, Whitley	447	20
Carter	1838	Greenup, Lawrence	413	30
Breathitt	1839	Clay, Perry, Estill	483	14
Letcher	1842	Perry, Harlan	355	48
Johnson	1843	Floyd, Lawrence, Morgan	268	80
Owsley	1843	Clay, Estill, Breathitt	216	97
Powell	1852	Montgomery, Clark, Estill	181	111
Rowan	1856	Fleming, Morgan	272	77
Jackson	1858	Estill, Owsley, Clay, Laurel, Madison, Rockcastle	333	55
Boyd	1860	Greenup, Carter, Lawrence	159	115
Magoffin	1860	Morgan, Johnson, Floyd	302	68
Wolfe	1860	Morgan, Breathitt, Owsley, Powell	230	92
Bell	1867	Harlan, Knox	384	41
Elliott	1869	Morgan, Carter, Lawrence	263	83
Menifee	1869	Bath, Morgan, Powell, Montgomery, Wolfe	203	100
Martin	1870	Pike, Johnson, Floyd, Lawrence	227	93
Lee	1870	Owsley, Estill, Wolfe, Breathitt	199	103
Leslie	1878	Clay, Perry, Harlan	373	43
Knott	1884	Perry, Floyd, Letcher, Breathitt	348	49
McCreary	1912	Wayne, Pulaski, Whitley	406	33

Average size of Kentucky county, ... 334.8 sq. mi.
Average size of Michigan county ..... 691.3 sq. mi.
Average size of county in the Kentucky Mountains ..... 359.3 sq. mi.

Data as to dates of admission of counties and old counties from which new ones were formed: Collins, Richard H., History of Kentucky, Vol. 2, p. 26; Commissioner of Agriculture, Twenty-Second Biennial Report, 1916-1917, pp. 110, 138. Seventeenth Biennial Report, 1906-1907, p. 506.

Data as to the area of the present counties and their relative rank in size in the State from the Fourteenth Census of the United States, Bulletin on Agriculture, Kentucky.

Physical Features.

Geologically, the Kentucky Mountains constitute the Eastern Coal Field. The strata of the Coal Measures of Eastern Kentucky are sandstones, shales and coals in the upper part of the formation and massive sandstones, and hard conglomerate ledges interspersed with shales and coals in the basal portion. On the western margin of the field, the "conglomeritic series" outcrops in a belt from five to twenty-five miles in width, the belt widening and the rock layers thickening to the south and southeast from the Ohio River.[17] The area of outcrop of these basal members of the coal measures embraces roughly the western third of the Kentucky Mountains. Over the eastern two-thirds of the Mountains, the dip of the strata to the southeast into the Eastern Kentucky Geo-syncline conceals the conglomeritic layers and leaves the shales and overlying sandstones to make up the surface, except in the Cumberland and Pine mountains. In each of these ranges, the summit is formed by the Basal Coal Measure Conglomerate. (See Fig. 1.)

Physiographically, the Kentucky Mountains represent a maturely stream-dissected plateau, with the crests of the ridges, which represent the remnants of the former even plateau surface, rising from an altitude of about 1,000 feet above sea level at the Ohio River to an elevation of 2,000 feet above the same datum plane at the Tennessee border.

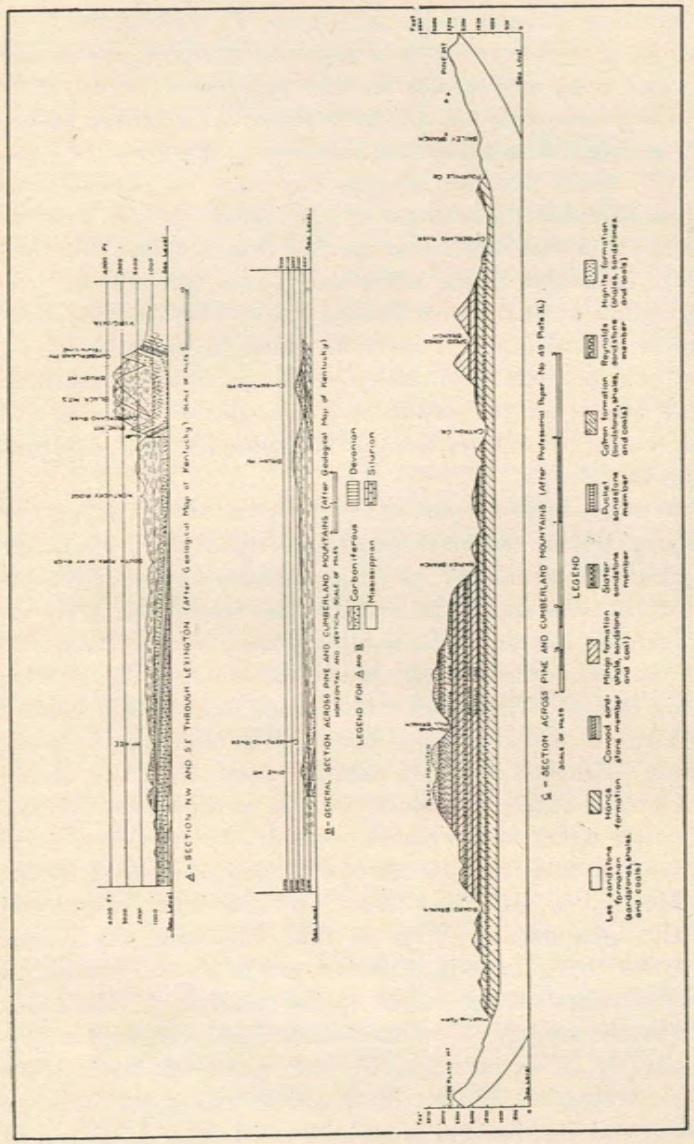

FIG. 1. SECTIONS TO SHOW GEOLOGICAL STRUCTURE.
A. Section of Eastern Kentucky along a line S. E. from Lexington. (After Geological Map of Kentucky.)
B. General section across Pine and Cumberland mountains. (After Geological Map of Ky.)
C. Section across Pine and Cumberland mountains near Harlan. (After Professional Paper No. 49, Plate II.)

In the plateau, head five large rivers, the Big Sandy, the Little Sandy, the Licking, the Kentucky and the Cumberland. Many of these streams have tributaries of considerable size. The region is thus covered by a network of rivers, creeks and forks which head against one another on opposite sides of the ridges which constitute the divides between the drainage basins.

These ridges in general have rather even sky lines (See Pls. I and VI) which has been accepted by many to indicate that the ridges represent the remnant of a peneplain, the age of which is fixed as Cretaceous because of the fact that the plain decreases gradually in height to the south and passes beneath the Cretaceous sediments of the Gulf Coastal Plain. There appear, however, to be several different levels at which the summits are accordant, which leads A. M. Miller to the conclusion that these different levels are the result of "atmospheric agencies and stream erosion acting on definite stratigraphic and deformational units."[18]

The ridges form a complex network over the major portion of the area, but in the southeast, Cumberland and Pine mountains parallel one another in a northeast-southwest direction, ten to twelve miles apart. In both of these ranges, the strata are highly inclined, the dip of the bedding planes being to the northwest in the Cumberland Range and to the southeast in the Pine Mountain Range. The Cumberland Range presents a steep face to the Virginia side; the steep face of Pine Mountain is to the northwest. Between these two parallel ranges, the Black Mountains, a mass of ridges and spurs, reach a maximum elevation of slightly over 4,000 feet. To the west of Yellow Creek, these ridges are known as the Log Mountains, and to the east, as the Black Mountains. In many cases, the individual ridges and spurs also bear names. West of Pine Mountain, the ridges, which extend irregularly in direction, are in general nameless.

The elevation of the ridges varies greatly. In the Black Mountains, the average elevation is about 3,500 feet, with a maximum slightly in excess of 4,000 feet above sea level. Pine Mountain averages 2,500 feet in elevation, with a maximum of 3,600 feet, and Cumberland Mountain varies from 2,500 feet at Pinnacle to 3,451 feet at White Rock. West of Pine Mountain, the ridges range from 200 to 700 feet above local drainage and decrease in elevation above sea level from 2,000 feet at the Tennessee border to 1,000 feet at the Ohio River, to the north and northwest. In the conglomerate area, the ridges are often of considerable width, containing considerable land used for agriculture; in other portions of the plateau, the ridges are often only wide enough for a narrow wagon road.

The character of the valleys is determined by the geological formation. On the western margin of the plateau, where hard conglomeritic ledges interspersed with shales outcrop, castellated forms are numerous and the valley sides often rise sheer from the valley floor several hundred feet, frequently making communication from valley to valley across the ridges almost impossible. Such a topography is well developed in Rockcastle County in the area drained by the Rockcastle River, both the county and the river deriving their names from the castellated forms which abound. Along such valleys the conglomerate layers frequently overhang and form rock houses. (See Plate XXV.)

In this western border, the creeks frequently cut through to the Mississippian limestone which, because of its solubility, gives rise to caves, sinks and underground channels. Some of the smaller streams flow for short distances through such channels. Creeks designated as "sinking creeks" are of this character. (See Fig. 3.)

Over the greater portion of the area, the rivers and creeks are bordered by alluvial deposits of considerable width and the valley walls rise steeply but not precipitously. The bottoms, which lie on alternate sides of the river, as the stream swings from side to side of the valley, usually afford a considerable amount of level land along the larger streams. Along the smaller creeks the bottoms are limited in extent and decrease rapidly in width upstream as shown in Plate IX.

On the margins of the present-day alluvial plains are older gravel and silt terraces. The flood plains of the Ohio and both the Big and Little Sandy rivers, for example, are bordered by such elevated alluvial deposits, the terraces of the Big Sandy River ranging from 8 to 10 feet above the level of the present-day floodplain. Ashland is built on such a terrace, well above flood level.[19] In addition to these high level river deposits, benches, determined by more resistant rock layers, frequently border stream courses and afford additional level land suitable for agricultural use.

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CHAPTER II

SUBDIVISIONS OF THE KENTUCKY MOUNTAINS.

Although similar economic conditions prevail in considerable measure throughout the Kentucky Mountains, topography, soils, vegetation, mineral resources and other environmental factors are combined with sufficient variation in the different portions to make it desirable to separate the area into subregions or smaller units, basing the subdivision upon the fact that in the different portions the various environmental combinations afford appreciable differences in opportunity, which have produced contrasted living conditions. In the following pages, the attempt is made to divide the area into sub-regions on the basis of those contrasts of the entire environment which have produced such differences in opportunity and activity.

The numerous illustrations which accompany this section are added to convey to the reader the differences in physical equipment and the differences in economic conditions which have resulted from variation in the type and amount of opportunity for development in the various portions of the area.

The Kentucky Mountains are lacking in marked climatic contrasts because of their relatively small areal extent and the absence of any considerable variation in elevation. Climatic differences are so slight that, except in combination with other factors, they have had no determinative effect upon the differentiation of human activities within the area. The basis for the division into sub-regions is found in topography, soils, and native vegetation, which are in turn determined largely by rock outcrop and structure. The mineral resources, which are an important factor in the economic development in many portions of the area, are also dependent upon the geological structure.

In the lower part of the formation, the Coal Measures of Eastern Kentucky are made up of massive cliff-forming sandstones, quartz pebble conglomerates and shales, and in the upper portion, of shales and less massive sandstones. The basal members of the formation outcrop along the western margin of the area as a narrow belt five miles in width at the north, where the conglomeritic portion of the formation is thin, but the belt widens to twenty-five miles to the south, where the conglomerate

layers thicken. The differences in the rock formations which outcrop in neighboring areas and the degree of dissection have resulted in great differences in topography. (See Figs. 3, 4, 5.) The character of the rock outcrop has determined the character and, in part, the amount of dissection by the rivers, and has caused great differences in soils and native vegetation, thereby affecting human occupation.

It is proposed to divide the Kentucky Mountains into two major subdivisions. Within each division, there will be minor differences, but in a study of this character, it will be necessary

FIG. 2. SUB-REGIONS OF THE KENTUCKY MOUNTAINS.

to disregard these minor variations. In naming the sub-regions, the attempt has been made to select descriptive names which accent some characteristic feature.

1000
1000
1000

In the accompanying map, Fig 2, on which the sub-regions are indicated, the boundaries as drawn are only approximations based on the best information available. Areas merge to a considerable extent, which renders it difficult to locate the boundary on a small map with a high degree of exactness without the introduction of a boundary line of undesirable complexity.

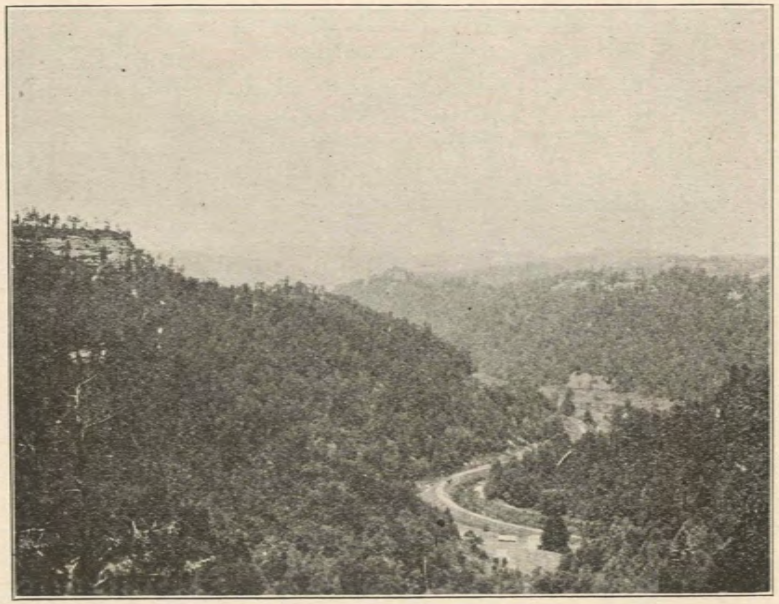

PLATE I. THE VALLEY OF BLOCK CREEK, WOLFE COUNTY. The precipitous valley walls are characteristic of the valleys of the western border.

In the descriptions of the sub-regions in Part I, no attempt is made to give a detailed description of the assets or occupations of each area, as these will be considered in Part II of this study. The object of this section is to sketch in the outstanding characteristics which give identity to the sub-regions.

The Ridge Top and Limestone Valley Settlements of the Western Border.

This area represents about one-third of the Kentucky Mountains and includes, at least in part, Wayne, Whitley, McCreary, Pulaski, Laurel, Rockcastle, Jackson, Owsley, Lee, Estill, Wolfe, Powell, Menifee, Morgan, Rowan, Elliott, Carter and Greenup

counties, or eighteen out of the thirty-four counties in the Eastern Carboniferous Plateau.

This is the area of outcrop of the Basal Coal Measures Conglomerate in which the streams have intrenched themselves deeply, with steep-sided to precipitous valley walls, often hundreds of feet in height. (See Pl. I.) Castellated forms are numerous. On account of the prevalence of shales and softer layers interspersed in the conglomeritic ledges, rock houses and natural bridges are common and waterfalls occur. (See Pls. II, III, XXV.) The Falls of the Cumberland (See Pl. III), the best known of the waterfalls, is caused by the presence of a hard ledge of the Rockcastle conglomerate in the bed of the stream.[1]

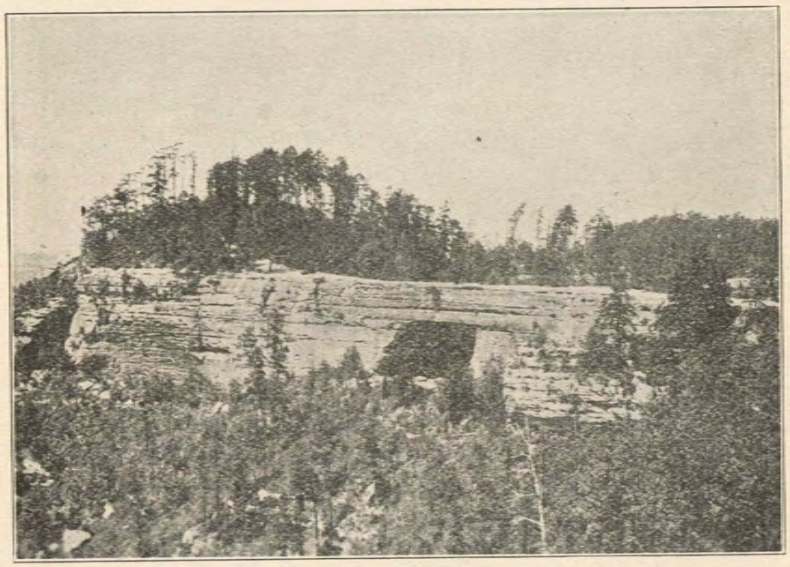

PLATE II. THE NATURAL BRIDGE AT NATURAL BRIDGE, WOLFE COUNTY.

On the western border, stream dissection has progressed so far that the ridges are narrow and the stream valleys are of fair width, but farther from the margin, the ridges are wider and the valleys have less level land along the stream margin. (See Figs. 3 and 4.)

Soils on the ridges are derived from the conglomerates and are, as a rule, thin and sandy, and in many places contain gravel.

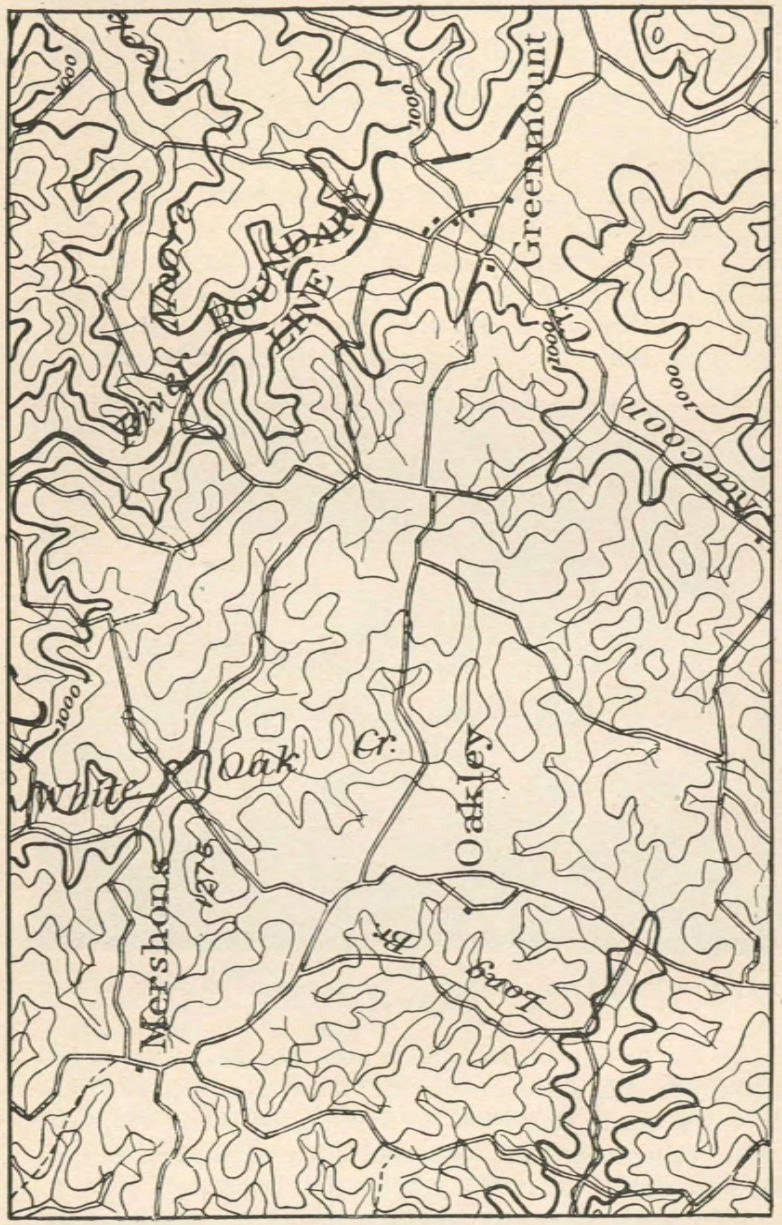

FIG. 4. TOPOGRAPHY OF THE AREA OF RIDGE TOP SETTLEMENTS.
Settlements and roads are on the ridges, which are wide. Contour interval, 100 feet. (After London topographic sheet, U. S. Geol. Surv.)

PLATE III. CUMBERLAND FALLS.
The hotel is to the left of the Falls.

They are not retentive of moisture as they contain little clay. As shown by chemical analysis and crop yield, their content of plant food is low. The soils range from sands to sandy loams which are usually underlain by a more clay like subsoil.[2]

The vegetation on the conglomerate outcrop is characteristic. (See Pl. IV.) The ridges are covered with black, yellow and white pine and some chestnut. On the slopes, where there is more moisture, hemlock grows, with an accompanying undergrowth of rhododendron (laurel), laurel (ivy), and other characteristic forms.

These ridge lands form very poor agricultural areas. Soils are thin and rock outcrops are not uncommon. Crops suffer severely during dry weather on the thin, sandy, infertile soils. Houses are poor and widely scattered. The log house is the common type. Outbuildings are practically unknown other than a few poor sheds. (See Pl. V.) Fodder is stored in the field. (See Pl. XIX.) Money is scarce and living conditions are very poor. In the narrow stream valleys, wherever there is any level

PLATE IV. CHARACTERISTIC GROWTH ON THE RIDGES, WOLFE COUNTY.

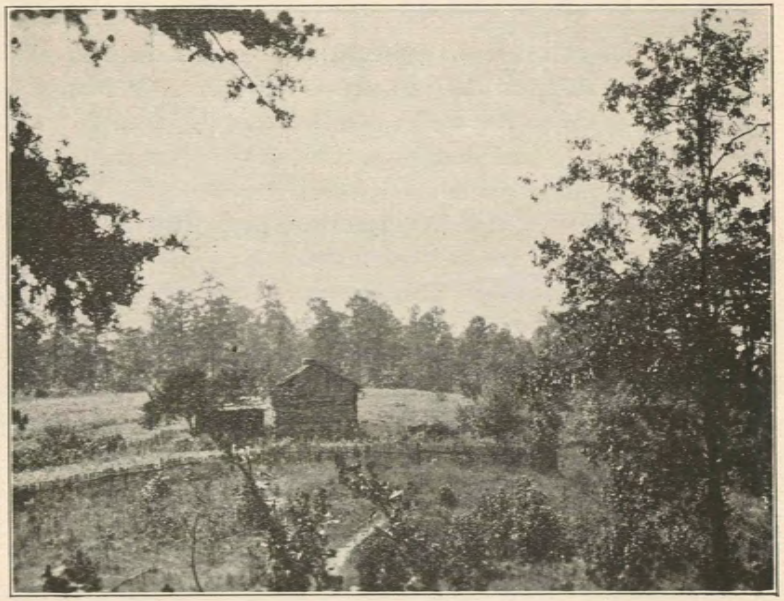

PLATE V. RIDGE FARM IN WHITLEY COUNTY.
Log house at right, outbuildings at left.

land available, a few poor farms are found. (See Pl. VI.) In these areas, the roads commonly follow the ridges. (See Figs. 3 and 4 and Pl. XXXIX.)

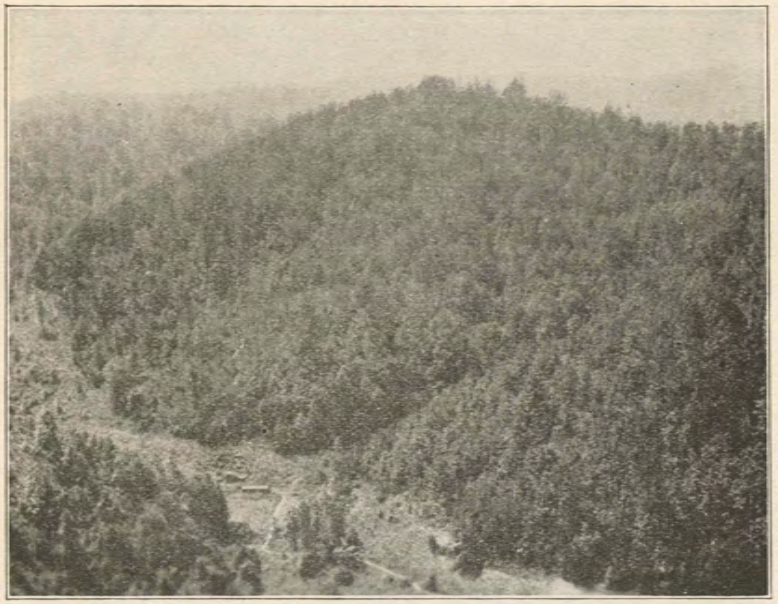

PLATE VI. VALLEY FARMS OF THE WESTERN MARGIN, WOLFE COUNTY.

On the extreme western margin of this area, where the ridges are very narrow and the bottoms are wider, the larger streams, as the Cumberland and Kentucky and their principal tributaries, have cut through to and excavated valleys in the underlying limestone. These valleys are often of considerable width and conditions are quite different from those on the ridge tops. Soils are alluvial, and in most cases, of high fertility. Originally these bottoms were heavily forested, but as they were settled at a very early date because of their superior desirability, the original forest cover has been entirely removed. By comparison with the poorer areas of the valleys upstream and the ridge tops, these wide, alluvial, limestone valleys are of high desirability. In reality, these valleys represent a penetration of the Mountains by the conditions of the area to the west. To some extent, they are included in the limits as mapped to avoid

FIG. 5. TOPOGRAPHY OF THE AREA OF CREEK BOTTOM SETTLEMENTS.
Roads follow the creek and the houses are closely spaced along the creek bottom roads. Breathitt County, near Jackson. Contour interval, 100 feet. (After Salyersville topographic sheet, U. S. Geol. Surv.)

the extraordinary complexity of the boundary which would result from their exclusion. Further, their inclusion in part is necessary as they are often surrounded and consequently modified by the Mountains with which they are in such intimate contact.

The Creek Bottom Settlements

The eastern two-thirds of the Kentucky Mountains are topographically very different in character from the western third. (See Fig. 5.) The ridges are in general higher, though this is not universally true; castellated forms, natural bridges and waterfalls are lacking and rock houses are neither so frequent nor so large. In addition, there is little level land on the ridges, in few cases enough for agricultural use. Farms are almost all on the bottoms, extending up every small creek and fork to the headwaters. (See Pl. IX.) Although the valley sides are steep, they are seldom precipitous and are in many cases cultivated to the summit of the ridge (See Pl. VII), particularly in the case

PLATE VII. A SLOPE CULTIVATED TO THE TOP OF THE RIDGE.
Near Hampton in northern Breathitt County.

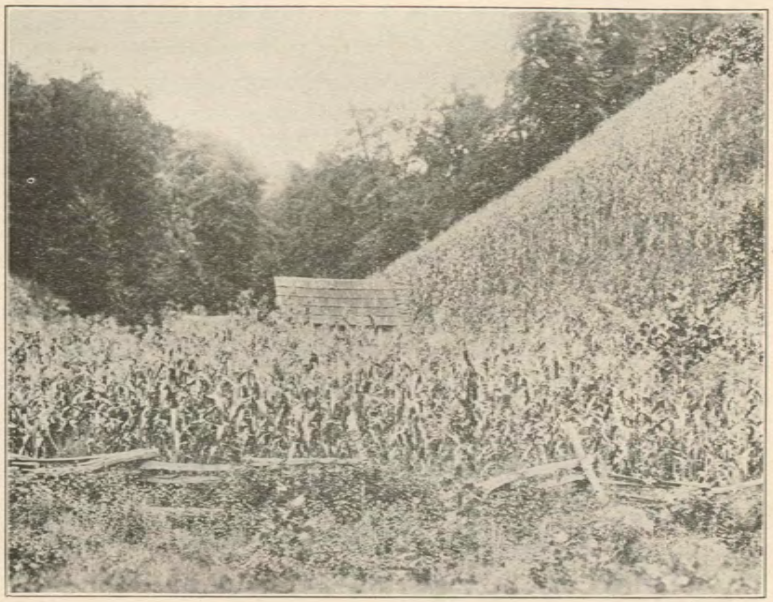

PLATE VIII. A "PERPENDICULAR" CORNFIELD IN CENTRAL BREATHITT COUNTY.

PLATE IX. A TYPICAL ROAD UP ONE OF THE SMALLER CREEKS. Breathitt County. The car is in the road. The small amount of level land alongside the creek is in corn.

of the lower ridges of the minor spurs. This is the region of the "perpendicular corn field." (See Pl. VIII.)

The soils of the hillsides are thin (Pls. VII, VIII, IX) and wash badly under cultivation so that they become valueless in a relatively short time, even though originally of fair fertility. The soils are in general loams and silt loams. Soils on the north and east facing hillsides and those in the coves are usually deeper than those on south and west facing hillsides and on the slopes bordering the larger valleys.[3]

These areas were originally forested with a heavy growth of oak, hickory, walnut, yellow poplar, ash, beech and a large number of less desirable species. On the sandstone ridges of Pine and Cumberland mountains, the characteristic flora of the conglomeritic outcrop occurs.

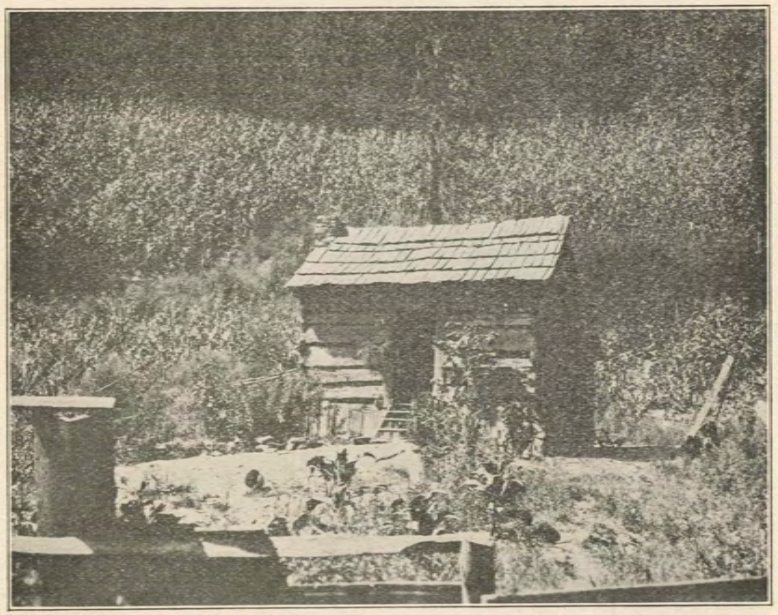

PLATE X. A TYPICAL SINGLE ROOM LOG HOUSE. Breathitt County. Outbuildings are entirely lacking.

In this portion of the Mountains, houses are rather closely spaced along the roads which, with few exceptions, follow the creeks (See Fig. 5), in many cases occupying the bed of the creek. (See Pl. IX.) Many of the houses are built of logs

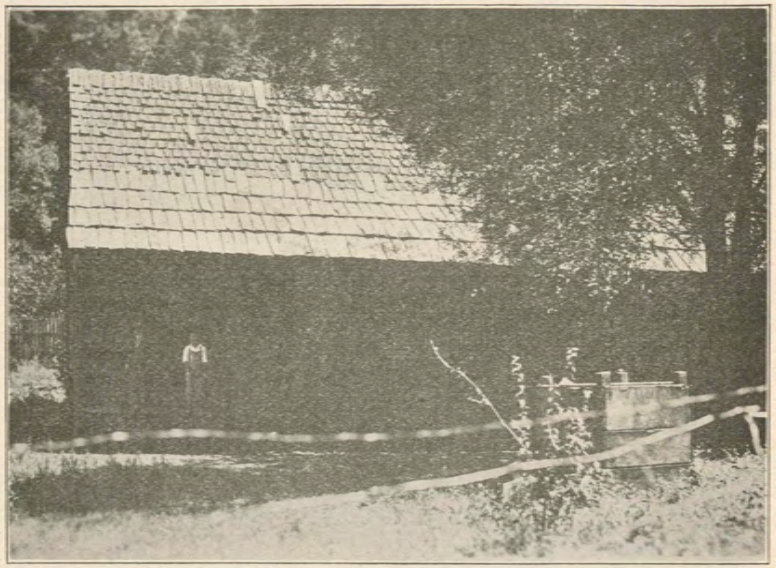

PLATE XI. A DOUBLE ROOM LOG HOUSE WITH CENTER HALL.
Breathitt County. Well in foreground to the left of the tree.

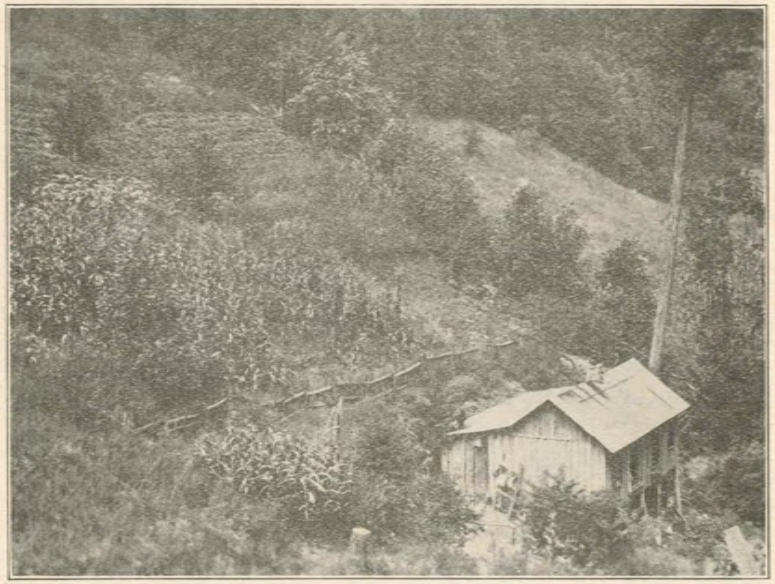

PLATE XII. A TYPICAL FRAME HOUSE.
On Messer Branch in Perry County.

with roofs of hand split shingles or boards. Some have but one room, though the two room house with center hall is of common occurrence. This house is frequently weatherboarded and painted in white. (See Pls. X and XI.) Outbuildings are few in number and very poor. The newer and poorer houses are of frame construction, unpainted and unplastered and seldom of more than two or three rooms. (See Pl. XII.) Living conditions are much the same as in the ridge settlements to the west, but the population is concentrated along the creeks instead of being scattered along the ridges at widely spaced intervals. In general, the eastern area is not so wild and communication is better than in the western third. From this comparison, the limestone valleys of the western third must be excepted, as they are in reality a penetration of the mountains by outliers of the area to the west, a region of better agricultural promise and performance.

The two sub-regions of the mountains which have been recognized are sufficiently distinct in their physical equipment and in the character of their occupation to warrant the division. The differences in topographic condition, soils, native vegetation and the distribution of mineral wealth have led to the following differences in the economic development: (1) A difference in the character of the area in agricultural use. (2) A difference in the distribution of the population based upon the differences in the area in agricultural use. (3) A difference in the density of the agricultural population. (4) A difference in the character and kind of lumbering operation. (5) A difference in the kind and amount of mineral wealth developed, particularly coal. In view of these differences, the areas are and should be regarded as entitled to separate consideration wherever such treatment will aid in understanding present conditions and the problems of the future.

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PART II

ECONOMIC CONDITIONS

CHAPTER III

THE LAND AND ITS USES

Unimproved Land

Unimproved land comprises a large percentage of the area of every county in the Mountains, constituting 65.1% of the total land surface. In none of the thirty-four mountain counties does the percentage of unimproved land fall below 27.3%, and in McCreary County, it rises to 89.4%. In the counties of the western border, the percentage of unimproved land is less than in the counties which lie entirely in the Mountains. Of the counties which lie wholly in the Mountains, none has to exceed 56.3% of its land surface improved and the percentage is generally much smaller.

The areas of maximum percentage of unimproved land are (1) the areas of the ridge top settlements which contain large tracts of ridge land with thin and sandy soils, (2) the Pine and Cumberland Mountain area where soils are thin on the steep slopes of the high ridges and where again the conglomeritic outcrops appear.

The unimproved land is practically all in timber, much of which is now inferior in kind and quality, and represents (1) land on slopes which are too steep or with too thin soils to tempt clearing for agricultural use; (2) a few somewhat gentler slopes with thicker soils which will probably be cleared and put to temporary use; (3) abandoned fields which have reverted to forest or are in the process of so doing; (4) a small amount of land which needs clearing and drainage. The first three classes comprise practically all the unimproved land. The area embraced in class (1) is remaining constant; in class (2), the area is decreasing; but in class (3), it is increasing at an alarming rate. Unimproved lands in class (4) are of minor areal extent and are only temporarily out of use.

The entire state witnessed an increase in the acreage of improved farm land for each decade prior to 1910. The area of improved farm land in the Mountains also increased steadily during the same period, the net increase between 1900 and 1910 alone, totaling 314,123 acres. Between 1910 and 1920, how-

GAIN AND LOSS OF IMPROVED FARM LAND FOR THE DECADE 1910-1920.

Counties	Gain in the Area of Improved Farm Land by the Clearing of Woodland.	Cultivated Net Loss of Acreage.	Net Gain of Cultivated Acreage.	Total Remaining Unimproved Acreage.
Bell	8,458		1,277	210,150(85.5%)
Boyd	375	4,050		51,031(50.1%)
Breathitt	16,789		11,578	221,696(55.8%)
Carter	9,188	18,148		144,766(38.1%)
Clay	7,673		5,880	196,428(46.1%)
Elliott	6,650	4,405		84,223(39.0%)
Estill**	334	7,828		101,491(48.1%)
Floyd	39,762	1,343		167,532(42.6%)
Greenup	15,832	9,818		134,199(44.3%)
Harlan	22,944	10,938		269,606(32.3%)
Jackson	2,896		1,019	133,294(34.7%)
Johnson	13,439	3,342		78,967(34.4%)
Knott	1,891		13,138	157,321(69.6%)
Knox	14,739	603		127,554(33.6%)
Laurel	13,641		3,739	182,799(30.3%)
Lawrence	11,082	4,447		118,292(38.9%)
Lee	1,889		2,732	87,739(41.0%)
Leslie	13,532		6,628	192,295(56.4%)
Letcher	18,825	4,002		176,265(35.7%)
McCreary	County not organized until 1912.			
Magoffin	25,432		640	98,436(48.6%)
Martin	16,237		907	118,020(55.3%)
Menifee**	1,176		1,324	89,126(44.4%)
Morgan	6,427		9,103	105,778(39.8%)
Owsley	10,903		10,099	76,937(35.7%)
Perry	35,860	294		165,941(41.9%)
Pike	79,833		6,768	365,239(55.7%)
Powell**	16,899	6,371		84,181(50.6%)
Pulaski**	38,542		2,190	200,316(33.5%)
Rockcastle**	4,672		3,596	111,389(43.5%)
Rowan**	2,836	856		132,398(52.1%)
Wayne**	40,638	12,688		188,510(50.1%)
Whitley	54,069	17,033		178,633(25.8%)
Wolfe	11,303	3,183		72,858(38.2%)
	564,766	109,349	80,618	5,055,921(41.4%)

All above data stated in acres.
**Border counties, only partially in the Mountains. Figures in parentheses indicate the percentage of the total land area of each county.
Data for the net loss and net gain of cultivated acreage and the total remaining unimproved acreage from the 14th Census. Data as to the gain in the area of improved farm land by the clearing of woodland only in part from the 14th Census.

ever, there was a decrease of 378,725 acres in the area of improved farm land in Kentucky, and paralleling this, practically no net increase in the amount of improved farm land in the Mountains, the increase for the decade amounting to only 1,893 acres. Though the clearing of woodland added more than 500,000 acres of new land to the cultivated area, the abandonment of fields so nearly balanced this addition that the total improved acreage remained essentially the same in 1920 as in 1910.

What has occurred in the Mountains has been a repetition of what has taken place in many other timbered, hilly areas. Up to a certain time, the clearing of new land adds enough to the cultivable area to offset the losses caused by the abandonment of fields. What occurred in the Mountains between 1910 and 1920 is only a continuation of what has been happening there since the settlement of the country. As long as the amount of uncleared land was sufficiently large, however, there was each year a net increase in the acreage of improved farm land, but as the clearing of the steeper slopes became necessary, the loss of improved farm land by soil erosion soon equalled the gain by clearing.

Nearly 65% of the unimproved land is included in farms. In many farms, the percentage of unimproved land is from 60 to 75% of the entire farm. The remaining 35% of the unimproved land, not included in farms, is embraced in greater part in large timber holdings or land held speculatively or for the development of mineral resources. There are also considerable areas of bare rock outcrop and excessively steep slopes which belong with these areas of unimproved land not in farms.

It is apparent that, for the area as a whole, a condition of equilibrium was reached about the end of the decade terminating in 1920. By that time, the amount of new land added by clearing balanced the loss by the abandonment of fields, made necessary by soil erosion. What happened in certain counties during that same period indicates what the future will witness in all the counties. In 20 out of the 34 counties, there was an actual decrease in the area of improved farm land in spite of extensive clearing of woodland in every one of the 20 counties.

All statistics in this chapter, unless stated otherwise, are based on the 14th Census. The war did not affect the agricultural economy of the mountains to any considerable extent, therefore the figures represent essentially the normal production and economic situation.

For the entire area, this decrease was balanced by gains in the other 14 counties, where clearing more than offset the abandonment of fields.

No longer can clearing of new land, however, be expected to keep pace with the losses which are bound to occur in increasing amount from year to year. The remaining 5,055,921 acres of unimproved land, or 41.4% of the entire area, represent, in larger part, steeper slopes which can never pass into permanent agricultural use. Large portions of these slopes are too steep to be considered as possibilities for even temporary cropping; over other large areas, rock exposures are so numerous and soils are so thin that no crops can be raised. Most of the level land has long been cleared; only the steeper slopes remain to be added to the cultivated area. When so added, their incorporation in the farm is only temporary, the average life of such slopes not exceeding six years. Under such circumstances, it is difficult to picture any possibility of further permanent expansion of the cropped area. Rather, a gradual but steady contraction of the area under plow must be expected.

The table which follows indicates conditions as they exist today. Improved land in farms constitutes too high a percentage of the land surface in view of the hilly character of the country. Unimproved land in farms, other than woodland in farms, represents fields ruined by cropping and erosion in greater part. A continuance of present trends indicates a great increase in the area of this type of land unless remedial measures are adopted.

1920 LAND TABLES.

COUNTY	Area of County in Acres.	Improved Land in Farms in Acres.	Percentage of Land Surface Improved.	Woodland in Farms in Acres.	Other Unimproved Land in Farms in Acres.	Unimproved Land Not in Farms, in Acres.	Total Unimproved Land in Acres.	Per Ct. of Land Surface Unimproved, in Acres.	Per Ct. of Total Surface Unimproved Farm Land in Acres.
Bell	245,760	35,610	14.4%	53,669	2,463	154,018	210,150	85.5%	22.8%
Boyd	101,760	50,738	49.8%	15,981	5,930	29,111	51,022	50.1%	21.6%
Breathitt	309,120	87,424	28.2%	164,060	8,325	49,311	221,696	71.7%	55.8%
Carter	264,320	119,554	45.2%	70,398	30,127	44,241	144,766	54.7%	38.1%
Clay	305,920	109,492	55.7%	131,812	8,824	55,792	196,428	64.2%	46.1%
Elliott	168,320	84,097	49.9%	51,414	14,114	18,695	84,223	50.0%	39.0%
Estill*	162,560	61,069	37.5%	70,972	7,119	23,400	101,491	62.4%	48.1%
Floyd	255,360	87,828	34.3%	102,549	5,926	59,057	167,532	65.6%	42.6%
Greenup	221,440	87,241	39.3%	81,168	16,705	36,326	134,199	60.6%	44.3%
Harlan	305,920	36,314	11.8%	91,189	7,329	171,088	269,606	88.1%	32.3%
Jackson	213,120	79,826	37.4%	67,857	5,960	59,477	133,294	62.5%	34.7%
Johnson	171,520	92,553	53.9%	52,850	6,076	20,041	78,967	46.0%	34.4%
Knott	222,720	65,399	29.3%	149,477	5,421	2,423	157,321	70.6%	69.6%
Knox	227,840	100,286	44.0%	69,843	6,746	50,965	127,554	55.9%	33.6%
Laurel	286,080	103,281	36.1%	68,510	18,264	96,025	182,799	63.8%	30.3%
Lawrence	270,080	151,788	56.2%	90,057	14,913	13,322	118,292	43.7%	38.9%
Lee	127,360	39,621	31.1%	51,306	872	35,561	87,739	68.8%	41.0%
Leslie	238,720	46,425	19.4%	132,976	1,586	57,733	192,295	80.5%	56.4%
Letcher	227,200	50,935	22.4%	79,094	1,977	95,194	176,265	77.5%	35.7%
McCreary	259,840	27,328	10.5%	54,095	5,391	173,026	232,512	89.4%	22.9%

1920 LAND TABLES—Continued

COUNTY	Area of County in Acres.	Improved Land in Farms in Acres.	Percentage of Land Surface Improved.	Woodland in Farms in Acres.	Other Unimproved Farms in Acres.	Unimproved Land Not in Farms, in Acres.	Total Unimproved Land in Acres.	Per Ct. of Land Surface Unimproved, in Acres.	Per Ct. of Total Surface Unimproved Farm Land in Acres.
Magoffin	193,280	94,844	49.0%	76,951	16,809	4,676	98,436	50.9%	48.6%
Martin	145,280	27,260	18.7%	77,784	2,447	37,789	118,020	81.2%	55.3%
Menifee*	129,920	40,794	31.3%	55,738	1,873	31,515	89,126	68.6%	44.4%
Morgan	233,600	127,822	54.7%	81,644	11,320	12,814	105,778	45.2%	39.8%
Owsley	138,240	61,293	44.3%	47,075	2,199	27,663	76,937	55.6%	35.7%
Perry	214,400	48,459	22.6%	87,100	2,692	76,149	165,941	77.3%	41.9%
Pike	498,560	133,321	26.7%	267,913	9,357	87,969	365,239	73.2%	55.7%
Powell*	115,840	31,659	27.3%	53,125	5,483	25,573	84,181	27.3%	50.6%
Pulaski*	401,920	201,604	50.1%	119,435	15,104	65,777	200,316	49.8%	33.5%
Rockcastle*	198,400	87,011	43.8%	78,872	7,341	25,176	111,389	56.1%	43.5%
Rowan*	174,080	41,682	23.9%	81,609	8,991	41,798	132,398	76.0%	52.1%
Wayne*	305,920	117,410	38.3%	139,180	13,833	35,497	188,510	61.6%	50.1%
Whitley	282,880	104,247	36.8%	65,200	7,521	105,892	178,633	63.1%	25.8%
Wolfe	147,200	74,342	50.5%	44,246	11,993	16,619	72,858	49.4%	38.2%
For the Mountains	7,764,480	2,708,557	34.8%	2,925,169	290,031	1,840,721	5,055,921	65.1%	41.4%

Based on data from 14th Census.
*Border counties, only in part in the mountains.

THE LAND AND ITS USES

Counties	DRAINAGE				
	Farm Land Reported as Provided with Drainage.	Farm Land Reported as Needing Drainage.	Land Needing Drainage Only.	Land Needing Drainage and Clearing.	No. of Farms in Drainage and Levee Districts.
Clay	756	8,044	868	7,176	3
Estill	955	4,126	151	3,975	.....
Laurel	1,171	17,247	1,083	16,164	.....
Powell	1,096	3,936	692	3,244	1
Pulaski	834	14,264	1,972	12,292	.....
Rowan	763	2,483	719	1,764	.....
Wayne	1,887	3,269	1,334	1,935	1
Whitley	1,053	2,604	1,233	1,371	1
	8,515	55,973	8,152	47,921	6

All above data in acres.
(Data from 14th Census.)

Comparatively little land in the Mountains is unimproved because of lack of drainage, as slopes are steep enough to insure rapid run off and effective natural drainage. On the larger bottoms is some land which might be drained to advantage, though very little has been done in this direction. Data are not available for making an accurate quantitative statement as to the amount of land which could be drained to advantage.

The above tabulation from the 14th Census returns shows eight counties making returns and the majority of these are border counties, which lie only in part in the Mountains. The presumption is that the lands needing drainage or both drainage and clearing lie in larger part outside the area and along the larger stream courses. Even on the assumption that all the land involved lies within the area under consideration, only 2.2% of the surface of these counties needs drainage. In the Mountains proper, where bottom lands are of less areal extent, the percentage would be even less. It is, therefore, apparent that lack of drainage is not one of the pressing and important problems of this part of Kentucky.

Timber and its Uses

The forests of the Mountains of Eastern Kentucky are a portion of the great Appalachian hardwood forest. The virgin forest, which once covered practically the entire area, contained an unsurpassed wealth of hardwood timber. Large oak, chestnut and yellow poplar, mixed with walnut, cherry, hickory, basswood, cucumber and other valuable hardwoods, occupied the coves and valleys, and on the ridges, white, yellow, and black or pitch pine appeared in considerable quantities. In the entire area of 10,450 square miles, it is probable that the original hardwood stand exceeded forty-five billion feet; by 1910, this had decreased to about eighteen billion feet; and by 1922, the total estimated stand of merchantable timber did not exceed five billion feet.

The forests of the basins of the principal rivers possess some minor differences in character, but are sufficiently similar in composition to make it unnecessary to differentiate between them in this consideration. The forests of all the drainage basins are of the mixed hardwood type, with pines on the drier ridges and hemlock on the moister portions of the areas of conglomeritic outcrop.

The character of the forest varies with the topography and the rock outcrop rather than with the river basin. In the area of creek bottom settlements, the eastern two-thirds of the Mountains, virgin timber consists largely of white oak, yellow poplar, chestnut oak, chestnut, beech, sugar maple, basswood (linn), cucumber, several species of hickory, walnut and black cherry mixed in varying proportions. The walnut, black cherry and large yellow poplar have been culled from all but a few isolated tracts. On the ridges and upper slopes, chestnut and chestnut oak are common trees, mixed with black and scarlet oak. Pine and hemlock constitute only a small percentage of the forest growth in this area, except in isolated cases where the conglomeritic outcrop appears, as on the flanks of Pine Mountain. The underbrush is largely reproduction of tree species. There is very little of the rhododendron which forms such dense growths elsewhere except in association with the typical "mountain flora" on the slopes of Pine Mountain.

To the west and south, in the area of ridge top settlements, the forest changes in character by the gradual increase in the proportion of black oaks and pine and by the decrease in the proportion of the other forest trees. Conifers here come in as an important element of the forest. (See Pl. XXXIX.) On the ridges of Powell, Wolfe and Estill counties, white pine, yellow pine, pitch pine and black and scarlet oak make up the bulk of the growth. (See Pl. IV.) On the sandy ridge and plateau lands of the southwestern counties, pine mixed with hardwood, especially chestnut oak, in many places forms 25% of the stand. Short leaf pine is the most abundant and valuable species, although scrub and pitch pine grow in commercial quantities. In some parts of Whitley County, pitch pine forms 50% of the merchantable forest. On the moister slopes, between the cliff and the stream, hemlock appears and rhododendron flourishes, forming thickets almost impossible to penetrate. These moister areas of conglomeritic outcrop limit the distribution of this growth.

In addition to the tree growth characteristic of the forested areas proper, the clearing and subsequent abandonment of fields have produced a very large area on which an old field type of growth occurs. Besides sassafras and various shrubs, hickory, black oak, locust and pines are characteristic invaders of the abandoned fields. The decade of 1910-1920 alone added over half a million acres to the area which will eventually be covered with this type of growth. These old field growths have progressed farther in the Upper Licking Valley than elsewhere, not because old fields are a more serious problem there, but because clearing has been going on for a longer period and growths have, therefore, reached a more advanced stage.

The earliest lumbering consisted of a removal of the more valuable and easily floated species. For many years, Kentucky was the center of the yellow poplar production of the country. In the Big Sandy region, in 1895, 75% of the floated timber was poplar, the average logs containing about 600 feet and ranging in length from 20 to 90 feet. By 1910, the average log contained only 370 feet and less than 25% of the lumber floated out was yellow poplar.[1] Today, virgin stands of yellow poplar in eastern Kentucky have disappeared except in a few small holdings.

Walnut was also one of the first trees to be cut, being taken out with the large poplar. Black cherry likewise, because of its high value, was one of the first trees to be removed. Today, the various oaks contribute the major portion of the hardwood cut. Hickory has been rather slow in being exploited because it could not be floated, but with improved methods of transportation, it is of more importance. In the south, a considerable fraction of the cut is pine.

Lumbering operations have progressed up the streams steadily until now every area has either been lumbered or is tributary to an operating lumbering enterprise. In 1910 for example, the headwaters of the Cumberland in Harlan County were virtually untouched; today, practically all the merchantable timber has been removed. The history of every river valley has been similar; with the coming of the railroad, the timber has been stripped from the hillsides within a few years.

PLATE XIII. RAFT OF LOGS TIED UP TO SHORE.
On the Kentucky River above Beattyville. The logs are chained to a long pole to make the raft.

The logs, when cut, are piled in the dry creek beds to await high water, at which time they can be floated or "splashed" down to the larger rivers. There they are made into rafts, individual logs being chained or otherwise fastened to a long pole. (See Pl. XIII). These rafts are floated or towed down stream to the larger mills. Typical of these larger mills is the one at Quicksand at the junction of Quicksand Creek and the North Fork of the Kentucky River, shown in Plate XIV.

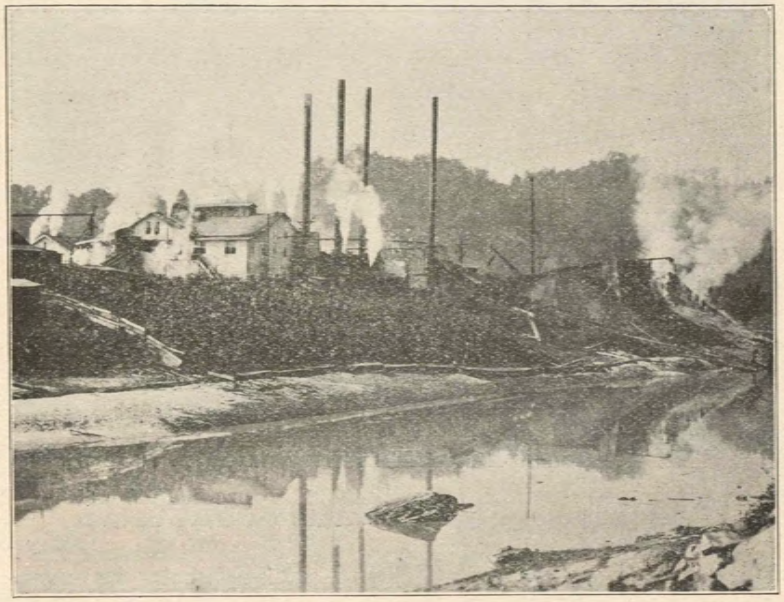

PLATE XIV. SAWMILL AT QUICKSAND.
At the junctions of Quicksand Creek and the North Fork of the Kentucky River, Breathitt County.

In some cases, lumber and ties are cut by small portable mills. The daily capacity of an average portable mill is 200 ties and 2,000 feet of lumber or 5,000 feet of lumber alone.[2] Such a small mill is shown in operation in Pl. XV. Few of these mills are operated steadily. In these small mills with circular saws, the waste due to wide kerf and untrue sawing may run to 50%, except in tie sawing, whereas in the band saw mills, the waste may not exceed 10% of the volume of the log. The small mill, however, allows the cutting of tracts from which

the logs cannot otherwise be marketed profitably. Some of the streams are interrupted by falls and rapids which make it impracticable to float logs to the larger mills downstream. In other cases, small tracts of culled and second growth stands can be cut to better advantage locally.

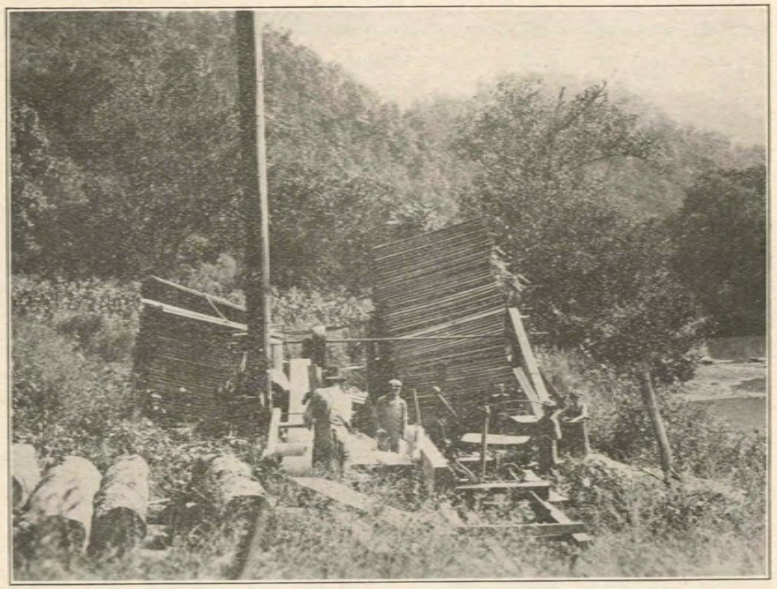

PLATE XV. SMALL PORTABLE MILL IN OPERATION.
Sawing lumber on Quicksand Creek in Breathitt County.

The products of the forest include not only lumber in various forms, but in addition, ties, staves, spokes and handles, posts, poles, shingles, tanning extract wood and bark, and fuel. The lumber cut is probably not to exceed 35% of the total drain on the forest.

Forest holdings are in general small and the ownership is widely scattered. In areas where extensive development of coal deposits has occurred or in sections where the land is held for the development of mineral resources, holdings are larger. The most significant of these large holdings is that recently acquired by Henry Ford of approximately 120,000 acres at the headwaters of the Middle and South Forks of the Kentucky River. This area was acquired primarily because of the coal

which underlies the surface. A few other fairly large tracts of timber are also held by large companies. The practice of selling mineral rights as separate from the surface and the custom of disposing of the timber only and retaining the land surface has apparently prevented the passing of the bulk of the timber land into the hands of a few individuals or companies. In fact, much of the exploitation of the timber has been by the small individual land owner who has cut and floated his own logs and hewed ties.

Bottom lands have long been cleared; all the timber remaining is on the steeper slopes and the ridges. Little virgin timber remains,* the tracts being few, small in extent, and isolated. Most of them lie at the headwaters of the Middle and South Forks of the Kentucky River. Early lumbering consisted of culling the choicest portion of the growth, trees such as walnut, yellow poplar, cherry, and the finest of the oak. Present operations are largely in these previously culled stands. The quality of the lumber produced is consequently inferior to the earlier production. Although much of the output is from second growth timber, the bulk of the lumber produced is still from the small area of old growth stands. Very shortly, with the exhaustion of the old growth, the entire supply of lumber must come from the second growth. This is bound to result in a still more serious drop in the quality of the lumber which will react upon the furniture and other industries dependent upon lumber of high grade.

Annual growth probably does not exceed half the "normal cut" according to the best information available. A continuation of this condition implies a speedy exhaustion of the small amount of timber remaining. The situation is even worse than is indicated by these figures, as the greater part of the cut is from the relatively concentrated stands of old growth timber, whereas the growth is in widely distributed second growth stands. The cut is also from large timber, yielding high grade lumber; the growth is largely low grade because of the small size of the trees.

The effect of the depletion of the timber supply which is occurring in the Appalachian hardwood region is already being felt by furniture and vehicle makers. The shortage is suf-

*In 1910, the U. S. Forest Service estimated the virgin timber to comprise less than 1 per cent of the forest.

ficiently acute to cause a change in the kind of lumber employed in manufacture. Oak constituted 74%, poplar 13%, and gum 1% of the wood used by furniture manufacturers in 1909. By 1919, the percentage of gum used had risen to 21%; oak constituted only 60% and poplar 6% of the lumber employed.[3] The future promises to see a further decrease in the use of oak and poplar and the use of a larger proportion of gum.

Whether the Kentucky Mountains shall continue to be producers of high grade hardwood lumber is of far more than local importance. Other former producing areas will not in the future be sources of any considerable supply. The hardwood forest lands of Ohio, Indiana and Illinois have been converted into farms as fast as the timber has been cleared and the same will be true for at least 90% of the bottom lands of the Mississippi Valley, our present major source of hardwood lumber. Wherever the cut is from rich agricultural lands, as it has been north of the Ohio and is today in the Mississippi Valley, the source of supply will be short lived. Once the present supply in these areas is exhausted, the timber supply of the country will be reduced permanently; the highest utilization of the land will not allow the cut to be maintained from growth, as is possible on non-agricultural lands. Some contributions will continue to come from farm woods of these agricultural areas, but the permanent supply of large sized, high grade hardwood saw timber must come largely from non-agricultural lands, such as exist in the Kentucky Mountains.

At least 50% of the land in the Mountains of Eastern Kentucky is absolute forest land, the slopes being too steep and the soils too thin to stand either cultivation or grazing. The reversion to forest of over half a million acres of these steep slopes during the decade ending 1920 is evidence of the non-agricultural character of much of the land which has been cleared and cropped. On many of the slopes where soils are sandy, the life of a field under cultivation does not exceed two or three years; where the soils are clays derived from shales, the effect of slope wash is less pronounced, but even on these slopes with clay soils, few fields will stand cropping more than five or six years. These steep, well drained slopes are admirably suited to the growth of a wide variety of valuable trees. Rainfall is abundant and well

distributed; the growing season is long, therefore trees make a rapid growth. As prices for timber are certain to advance with the continual depletion of the supply, a forest crop wisely administered should yield better returns than are secured by present practice.

The scenic value of mountain forests is also important. With the improvement of roads, travel should increase, provided the natural beauty is not marred by the removal of the forest. Denuded hillsides are unattractive, but if the forest cover is maintained, a considerable tourist business should develop. Large centers of population, from which the Mountains would be easily accessible over good roads, are near at hand. The scenery, the advertisement which the Mountains have received in story, and the cool nights which afford relief from the oppressive summer heat of the adjacent plains areas, should, on becoming known, draw many people into the area each summer.

The practice of clearing steep slopes, entirely aside from its effect upon the timber resources, is a short sighted and unwise procedure. It does not permanently increase the area available for agriculture; it is a temporary expedient which affords for a short period only a slightly larger acreage of plow land. Already the folly of clearing these slopes is becoming apparent. In spite of the addition of over half a million acres of land by the clearing of the steeper slopes during the past decade, the net increase in acreage of improved farm land was only about 2,000 acres. Reversion to forest of slopes formerly cleared and now abandoned practically offset the gain by clearing.

Slope wash injures the bottom lands by the deposition of material and silts up the stream channels, making them less available for navigation and the development of power. The clearing of the slopes increases the rapidity of the run off and the fluctuation in stream volume, which again decreases the value of the streams for both navigation and the generation of power. These floods in the Mountains help to swell the floods of the Ohio and Mississippi rivers so that they assume more than local importance.

In the type of climate which exists, with the bulk of the precipitation in the form of rain, much of it falling in the spring and fall when the ground is bare and seldom frozen to great

depths, with steep slopes and thin soils, the small return to be obtained by the clearing of steep slopes in no way compensates for the losses which ensue. Forests will grow on these slopes. This is not now and never will be primarily an agricultural area, even though the larger portion of the population may at present wring a bare existence from the soil. Productivity of a large portion of the area under crops is decreasing and will continue to decrease. Over a large fraction of the Mountains, the only resource which can yield returns and yet be conserved indefinitely as a *permanent* producer of income is the forest. The importance of this cannot be overemphasized. The area is today at a critical period in its economic history. A large fraction of the surface is becoming non-productive by the clearing of the forest and the removal of land from the agricultural column.

This is a condition which should be remedied by a restoration of the forest cover on the steeper slopes, which may be accomplished either by planting or by establishing conditions which will permit of natural reproduction, especially of the more desirable species.

In this connection, the recent offer to the state of 16,000 acres of cut over land in Breathitt, Perry and Knott counties by Mowbray and Robinson, together with a trust fund of $1,000,000 by E. O. Robinson, is of interest. It is proposed to have this tract of land administered by the State University as a forest and thus to demonstrate the value of forestry in the economic system of the mountain counties.

To facilitate the process of natural reproduction after lumbering, the following measures should be taken: (1) Thrifty seed trees of poplar, white oak, ash, walnut and other desirable species for any given locality should be left to insure reproduction; (2) Young growth should be protected as much as practicable during lumbering operations; (3) Land owners should insist that only the least valuable species be used in construction work in lumbering operations; (4) Inferior timber should be used on the farm wherever it will serve the purpose instead of young and thrifty trees of the more valuable species.

Forests, once established, should be protected from fires and from damage by stock. In order to allow the better species

to reach merchantable size, timber of the inferior kinds should be used on the farm wherever it will serve the purpose.

Fires produce more damage than is commonly believed, as seedlings and sprouts are killed, thus destroying the continuity and permanence of the forest. In addition, fires damage standing timber and destroy the leaf cover and the fertility of the soil.

Stock should not be allowed to run loose in the woods, as cattle browse on the sprouts and prevent reproduction, and hogs destroy seeds and seedlings in the hardwood forests as well as injure the moisture conditions of the forest soils by rooting. The enforcement of an effective stock law also decreases the amount of land which is burned over every spring to improve the pasture. If cattle are kept out of the woods, no object is served by burning and the practice will cease.

To promote reforestation, the state should make the tax burden such as to encourage the growth of timber. Only by an adjustment of the tax so that the private owner can afford to produce a forest crop will it be possible to expect any important addition to the area in forest. A failure on the part of the state to impose reasonable taxes on timbered land can result only in loss of revenue and the eventual reversion to the state of large areas of unproductive land for the non-payment of taxes. Tax delinquency has as yet only begun, but there can be no question that each year will witness an increasing reversion to the state for the non-payment of taxes. Other states which have large areas of deforested, non-agricultural lands have learned this by experience. The State of Kentucky can well profit by their lesson.

The enterprise of reforestation is of benefit not only to the mountain counties, but to the entire state as well. Increased wealth in the mountain counties enables them to bear their proper burden of state taxation. In addition, an adequate supply of timber at reasonable prices is a distinct advantage to the entire state. Under these circumstances, the state can well afford to cooperate with the mountain counties in the formulation of a program to insure a permanent forest cover on the non-agricultural lands of the steeper slopes.

Improved Land

Farms

In the past forty years, the following changes have occurred in rural conditions: (1) There has been an increase in the number of farms; (2) There has been an increase in the total amount of improved land in farms; (3) There has been a marked decrease in the size of the farms; (4) Land has increased greatly in value.

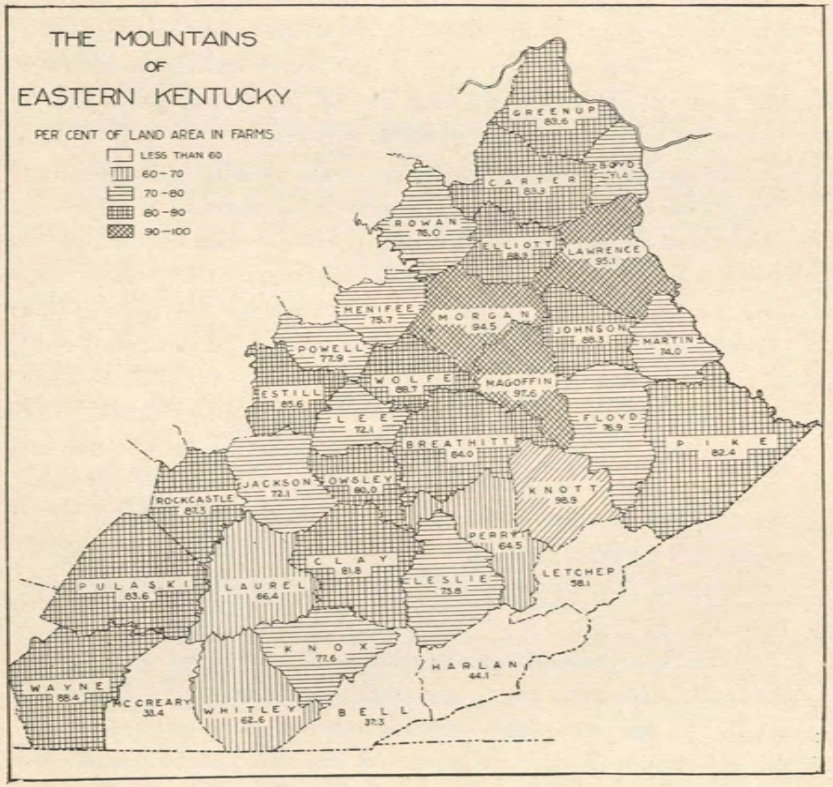

FIG. 6. PERCENTAGE OF LAND AREA IN FARMS.

NUMBER OF FARMS 1880-1920.

Counties	1880	1890	1900	1910	1920	Percentage of Change in No. of Farms 1880-1920.
Bell	796	739	1,420	1,349	1,664	109%
Boyd	441	422	708	997	830	88%
Breathitt	1,083	1,296	2,048	2,620	2,835	161%
Carter	1,326	1,612	2,738	3,261	2,644	99%
Clay	1,414	1,654	2,477	2,916	3,088	118%
Elliott	1,119	1,335	1,597	1,619	1,537	37%
Estill	1,199	1,284	1,665	1,881	1,832	52%
Floyd	1,529	1,818	2,490	2,921	3,032	99%
Greenup	960	1,173	1,897	2,364	2,023	110%
Harlan	847	1,033	1,674	1,593	1,452	71%
Jackson	1,036	1,320	1,799	1,944	2,054	99%
Johnson	1,260	1,398	2,252	2,416	2,185	73%
Knott	.....	851	1,392	1,771	1,856	.....
Knox	1,394	1,540	2,318	2,771	2,877	106%
Laurel	1,246	1,729	2,330	2,780	2,937	135%
Lawrence	1,713	1,944	2,959	3,036	2,616	52%
Lee	574	533	1,022	1,228	1,084	88%
Leslie	506	603	982	1,343	1,695	234%
Letcher	1,022	1,120	1,487	1,596	1,601	56%
McCreary	Not organized until 1912				1,161	.....
Magoffin	963	1,365	1,855	2,184	2,231	131%
Martin	427	573	942	1,051	1,087	154%
Menifee	423	687	979	1,084	1,055	149%
Morgan	1,440	1,775	2,278	2,569	2,889	100%
Owsley	632	805	1,223	1,408	1,331	110%
Perry	816	985	1,347	1,716	1,322	62%
Pike	2,000	2,288	3,684	4,583	4,471	123%
Powell	441	467	895	998	844	91%
Pulaski	2,777	3,166	4,506	5,034	5,015	80%
Rockcastle	1,294	1,355	1,747	2,160	2,302	77%
Rowan	539	726	1,112	1,179	1,303	141%
Wayne	1,514	1,457	2,304	2,670	2,448	61%
Whitley	1,408	2,179	3,111	3,430	2,614	85%
Wolfe	869	1,197	1,390	1,519	1,299	49%
Total number of farms	35,008	42,429	62,628	71,991	71,214	131%

CHANGE IN NUMBER OF FARMS FOR ALL COUNTIES.

1910-1920 Change in number = —777 Percentage change = —1.0%
1900-1910 Change in number = +9,363 Percentage change = +14.9%
1890-1900 Change in number = +20,199 Percentage change = +47.6%
1880-1890 Change in number = +7,421 Percentage change = +21.1%

Based on data from U. S. Census.

Every decade up to 1910 witnessed a gradual increase in the number of farms, but between 1910 and 1920, the number decreased slightly. This indicates that a decrease rather than an increase in the total number of farms may be expected for one or more decades, until farm sizes are better adjusted to the physical conditions of the area than is true at present. During this period of adjustment, the number of farms may increase slightly in the more isolated counties, but eventually all counties will show a smaller number of farms than they do at the present time. This eventual and considerable decrease in the number of farms will be forced by decreased yields and the passing out of agricultural use of a large percentage of the land which is now being cropped, with the consequent necessity for the enlargement of the farms. In counties which are at present losing in the number of farms, yields are declining.

The increase in the number of farms which occurred in all counties up to 1910, and in many counties up to 1920, is only in small part the result of an expansion of the area included in farms. The increase in number was largely due to the subdivision of previously existing farms with an accompanying reduction in size of the individual farm. This process of sub-division has slightly more than doubled the number of farms in the Mountains during the past forty years, whereas the addition of land, not previously included in farms, has increased the total number of farms only about twenty-five per cent.

The actual increase in the number of farms, as well as the percentage of increase, was greatest for the decade ending in 1900. The end of this decade marks the termination of a period of rapid increase in the number of farms in other portions of Kentucky as well.

The increase in number of farms has not been confined to any one portion of the Mountains, although the percentage of change in the number of farms between 1880 and 1920 is not regular from county to county. Up to 1900, the end of the period of rapid expansion, the Mountains had been essentially untouched by modern development. The area was isolated and cut off from the outside world to such an extent that emigration was relatively small in amount, and this, coupled with the rapid increase in population, forced an increase in the number of

farms, largely by the process of subdivision. Essentially the same conditions existed in all the counties, hence all showed a great increase in the number of farms up to 1900, with some variation from county to county in the percentage increase. The recent exploitation of the resources of the area, particularly the development of the coal, has led to the abandonment of many of the poorer farms from which it has been impossible to wring more than a bare existence. The people from many of these farms have moved to the mining centers where they find employment in the mines. This decreases the pressure on the land and reduces the number of farms. This movement has been under way only a short time, but it will probably continue to be effective for several years in decreasing the number of farms over a continually increasing area.

The average farm in the Mountains is the above state average in size. This has been true for the past forty years, though the gap between the state average and the average for this region decreased steadily with each decade to 1910. In 1880, in only two mountain counties, Carter and Elliott, were the farms below the state average in size and these two counties cannot be considered typical mountain counties. By 1910, however, the farms of 50% of the counties had fallen below the state average in size. Since 1910, the gap has begun to widen, and in only 33% of the mountain counties were farms below the state average in size in 1920.

The decrease in size of the farms was produced by subdivision of previously existing farms with the resultant increase in the number of farms discussed previously. The present average farm size of 83.1 acres would not be excessively low if it were not for topographic conditions, but when these are taken into account, it is apparent that farms are too small to support a family comfortably under present agricultural practice. Any further permanent reduction in the size of farms is not to be expected. In 13 out of 34 counties in the Mountains, the past decade has witnessed an increase in the size of the average farm. This is indicative of the present trend in the size of farms.

THE LAND AND ITS USES.

Average Size of Farms in Acres, by Decades, 1880-1920.

COUNTIES	1880	1890	1900	1910	1920
Bell	190	192	100.9	72.6	55.1
Boyd	198	134	92.0	71.8	87.5
Breathitt	330	216	127.7	100.0	91.6
Carter	123	110	77.4	74.1	83.2
Clay	170	173	98.8	83.7	81.0
Elliott	122	116	94.3	92.5	97.3
Estill	156	108	83.0	75.9	76.0
Floyd	205	130	98.3	80.5	64.7
Greenup	168	144	85.8	83.3	91.5
Harlan	260	206	107.2	101.6	92.9
Jackson	133	109	86.9	90.6	74.8
Johnson	132	121	73.6	67.7	69.3
Knott	.....	245	132.7	114.3	118.7
Knox	142	125	85.9	67.7	61.5
Laurel	150	112	87.9	67.7	64.7
Lawrence	133	119	83.7	85.8	98.1
Lee	170	127	85.9	70.4	84.7
Leslie	282	247	176.3	126.0	106.8
Letcher	250	186	109.5	96.6	82.5
McCreary	Not organized until 1912				74.8
Magoffin	216	153	88.3	90.6	84.5
Martin	221	178	99.9	86.0	98.9
Menifee	216	160	104.7	88.3	93.3
Morgan	167	123	90.8	82.0	76.4
Owsley	183	138	90.0	78.3	83.1
Perry	291	227	127.5	101.9	104.6
Pike	212	217	137.4	105.0	91.8
Powell	161	142	119.7	112.4	107.9
Pulaski	125	109	81.6	73.1	67.0
Rockcastle	135	114	93.9	79.1	75.2
Rowan	162	166	100.1	108.7	101.5
Wayne	153	178	124.3	118.9	110.5
Whitley	173	118	89.0	72.4	67.7
Wolfe	195	124	105.7	90.5	100.5
Average for the Mountains	176	144	99.0	86.3	83.1
State average	129	119	93.6	85.6	79.9

Data from U. S. Census.

There has never been any valid reason for the small farm in the Mountains except as it has apparently been forced on the inhabitants by what they conceived as necessity, but what was in reality ignorance of superior opportunity elsewhere. With the passing of the isolation of the mountain area with improved methods of communication, the more mobile younger generation leaves the farms; the necessity for the small farm disappears and it ceases to exist.

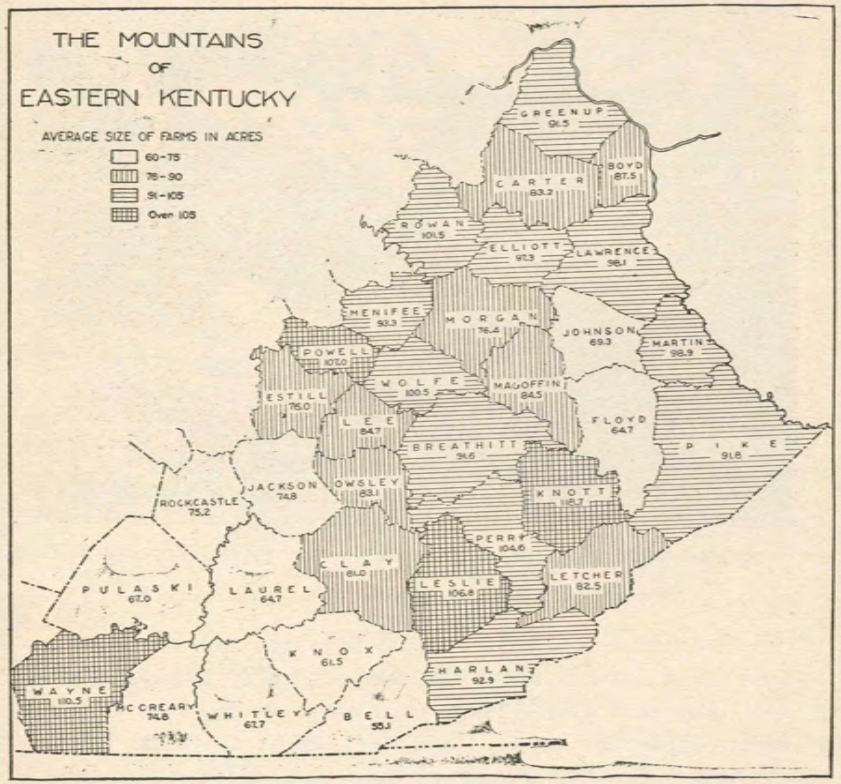

FIG. 7. AVERAGE SIZE OF FARMS IN ACRES.

In the Mountains, the number of acres of improved land per farm, as well as the percentage of land improved and the percentage of land in farms, is below the state average. In 1920, for example, only 34.8% of the land surface of the Mountains was improved as against a state average of 54.3%, and of the land in farms, only 44% was improved as compared with a state

average of 64.7%. This same relationship has existed for the past four decades. In view of the small size of the farms and the great pressure on the land, this emphasizes the permanently non-agricultural character of a large fraction of the land surface.

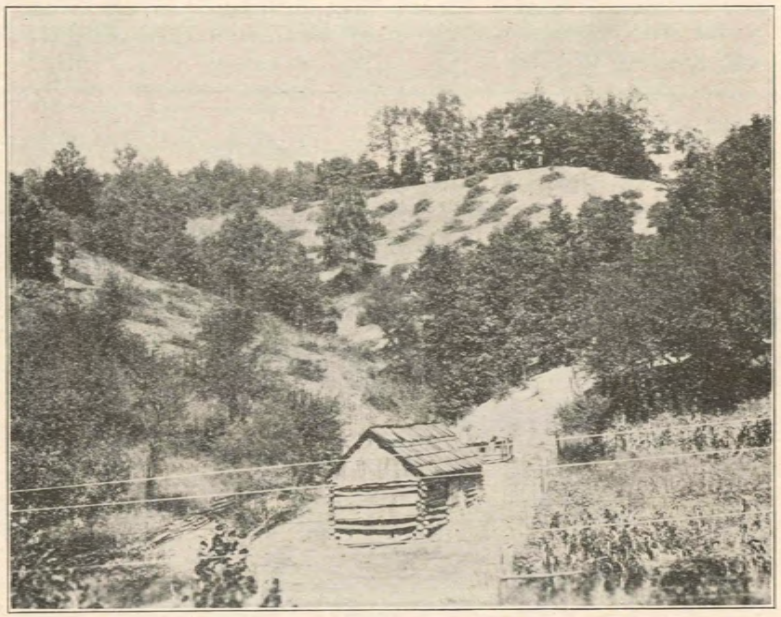

PLATE XVI. CLEARING A STEEP SLOPE PREPARATORY TO TEMPORARY USE.
"Soil mining" at its worst near Tallega, Lee County.

The actual number of acres of improved land per farm has been maintained at about the same figure by the clearing of new land each year. These clearings have been on hillsides where slopes are steep. Plate XVI shows a typical hillside clearing. Such fields can be used only a few years before erosion robs the rock of its thin soil cover. The field is then abandoned to revert to forest and a new slope is cleared. By this process, the total improved acreage and the number of acres of improved land per farm have been maintained without loss.

The slopes which are being cleared at present and put to such temporary use are often so steep (See Pls. VII, VIII, XII and XVII) and their life under use is so short that the crops produced hardly compensate for the labor involved in clearing the land and the planting and harvesting of the crops. The past decade witnessed the loss of half a million acres of such land and the clearing of an equal amount to replace the loss. At the present rate of clearing, all unimproved land will have been added to the cropped area in not to exceed eighty years. Thereafter, the area will lose in improved farm land at a rate of not less than 50,000 acres per year for an extended period of years, until all the steep slopes revert to forest.

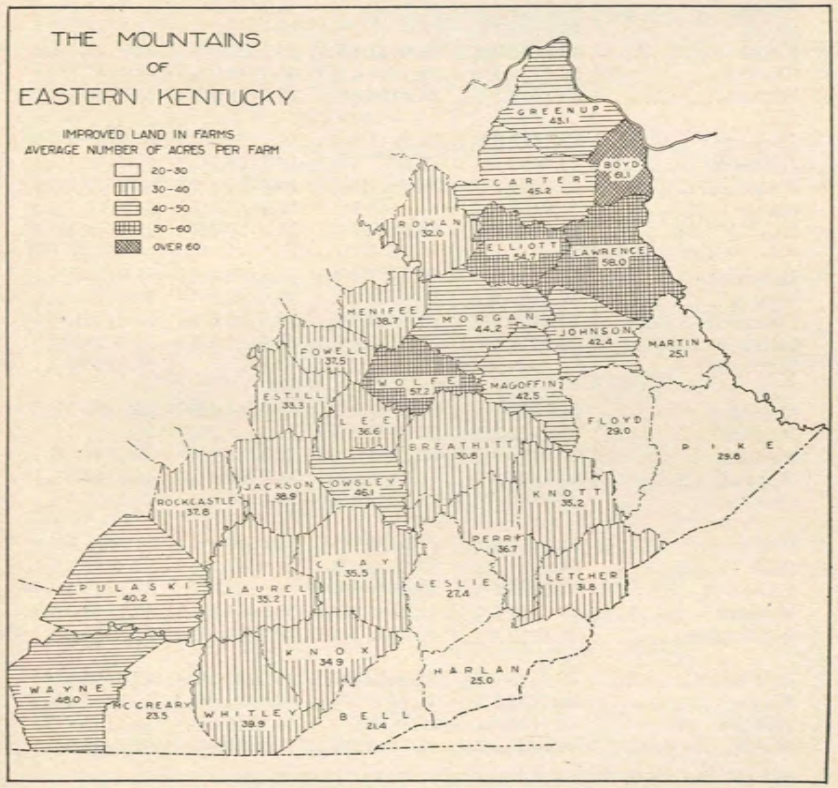

FIG. 8. IMPROVED LAND IN FARMS.

The percentage of land in farms improved is much too high. This has resulted from the great pressure on the land which has led to the clearing and temporary use of slopes which should have been left in forest. It is believed that conditions are changing with sufficient rapidity so that aroused and enlightened

IMPROVED LAND IN FARMS 1890-1920.
Average Number of Acres Per Farm.

County	1890	1900	1910	1920
Bell	37.4(19.4%)	28.9(28.6%)	25.4(35.0%)	21.4(38.3%)
Boyd	85.3(63.6%)	63.1(68.5%)	55.0(76.6%)	61.1(69.8%)
Breathitt	31.3(14.4%)	29.2(22.8%)	28.9(29.0%)	30.8(33.6%)
Carter	44.5(40.4%)	41.3(53.3%)	42.2(57.0%)	45.2(54.3%)
Clay	41.9(24.2%)	36.6(37.0%)	35.5(42.4%)	35.5(43.8%)
Elliott	42.3(36.4%)	47.9(50.7%)	54.7(59.1%)	54.7(56.2%)
Estill	46.0(42.6%)	38.0(45.7%)	36.6(48.2%)	33.3(43.9%)
Floyd	30.8(23.6%)	30.8(31.3%)	30.5(37.9%)	29.0(44.7%)
Greenup	55.4(38.4%)	39.7(46.1%)	41.1(49.3%)	43.1(47.1%)
Harlan	33.3(16.1%)	28.0(26.1%)	29.7(29.2%)	25.0(26.9%)
Jackson	35.2(32.2%)	36.2(41.6%)	40.5(51.3%)	38.9(52.0%)
Johnson	44.4(36.6%)	37.9(51.4%)	39.7(58.6%)	42.4(61.1%)
Knott	35.0(14.2%)	28.0(21.1%)	29.5(25.8%)	35.2(29.7%)
Knox	41.3(33.0%)	41.4(48.1%)	36.4(53.8%)	34.9(56.7%)
Laurel	39.1(34.9%)	39.8(45.2%)	35.8(52.9%)	35.2(54.3%)
Lawrence	48.9(41.0%)	44.2(52.8%)	51.5(60.0%)	58.0(59.1%)
Lee	37.6(29.6%)	30.0(34.9%)	30.0(42.7%)	36.6(43.2%)
Leslie	34.6(14.0%)	51.7(29.3%)	29.6(23.5%)	27.4(25.7%)
Letcher	32.9(19.6%)	33.5(30.5%)	34.4(35.6%)	31.8(38.6%)
McCreary	Not organized until 1912.			23.5(31.5%)
Magoffin	44.6(29.1%)	36.5(41.3%)	41.6(46.0%)	42.5(50.3%)
Martin	21.9(12.3%)	25.3(25.3%)	25.1(29.2%)	25.1(25.4%)
Menifee	32.7(20.4%)	33.2(31.7%)	36.4(41.2%)	38.7(41.5%)
Morgan	42.9(34.8%)	42.2(46.3%)	46.2(56.4%)	44.2(57.9%)
Owsley	44.5(32.2%)	38.2(42.4%)	36.4(46.4%)	46.1(55.4%)
Perry	31.7(13.9%)	27.0(21.1%)	28.4(27.9%)	36.7(35.1%)
Pike	38.4(17.6%)	27.3(19.8%)	27.6(26.3%)	29.8(32.5%)
Powell	43.7(30.7%)	40.9(34.1%)	38.1(33.9%)	37.5(35.1%)
Pulaski	48.6(44.5%)	41.2(50.4%)	39.6(54.2%)	40.2(60.0%)
Rockcastle	49.4(43.3%)	42.7(45.4%)	38.6(48.8%)	37.8(50.2%)
Rowan	37.5(22.5%)	51.4(51.4%)	36.1(33.2%)	32.0(31.5%)
Wayne	64.7(36.3%)	52.7(42.3%)	48.7(41.0%)	48.0(43.4%)
Whitley	40.9(34.6%)	37.4(42.0%)	35.4(48.8%)	39.9(58.8%)
Wolfe	44.1(35.5%)	47.1(44.5%)	51.0(56.4%)	57.2(56.9%)
Average for the Mountains	42.2(29.3%)	38.2(39.2%)	37.5(43.4%)	38.0(44.0%)
Average for the State	65.9(55.2%)	58.5(62.5%)	55.3(64.6%)	51.6(64.7%)

Figures in parentheses indicate the percentage of the farm improved.

Based on data from U. S. Census.

public opinion will prevent the total destruction of the slopes. If nothing is done to arrest this process, however, and present conditions continue, the slopes are doomed.

Prior to 1900, average land values were only nominal in the Mountains, being only 33% of the state average. Although the percentage relationship has not altered materially, and though still far below the average for the entire state, average land values in the Mountains have practically doubled for each decade since 1900. This rapid increase in values has resulted from the opening of the country by railroads and the exploitation of the timber, oil, gas, and coal resources of the area. For agricultural use, the average land values are still low and promise little increase for the future.

The maximum increase in values has occurred in those counties which have witnessed the greatest amount of development of the mineral resources. In Harlan County, which contains little good agricultural land, coal mining operations have caused an increase in average land values of 928% in the past twenty years, raising values to practically the state average from the original average price of $4.65 per acre. Similar large increases in value have also occurred in all the other counties where active mining is in progress.

Inasmuch as the exploitation of the mineral resources has as yet only begun, even in those counties where most development has occurred, while in many counties, due to the lack of transportation, the mineral wealth is only a potential asset, it is probable that values will increase comparably during the next decade. Similar increases in land values cannot be expected in other portions of the state. In fact, in many purely agricultural areas, the high prices which prevailed during 1918-1920 have already suffered a severe decline. Present trends and possibilities of this area point to large future increases and to average land values comparable to those of other portions of the state within a relatively short period of time.

For agricultural use, both the assessed and the market values of the land are too high on the basis of net returns from crops raised. In Knott County, for example, where there is practically no coal mining, an average farm in 1919 contained 118.7 acres, 35.2 acres of which were improved. The assessed

LAND VALUES 1900-1920.

Counties	Per Acre			Percentage of Increase by Decades	
	1900	1910	1920	1900-1910	1910-1920
Bell	4.93	14.67	20.95	197%	42%
Boyd	9.63	17.80	36.66	84%	104%
Breathitt	3.08	7.93	12.56	157%	58%
Carter	5.05	8.35	17.18	65%	105%
Clay	4.15	7.53	15.40	81%	104%
Elliott	3.68	5.66	11.88	53%	109%
Estill	5.43	10.81	20.80	99%	92%
Floyd	4.06	11.01	22.56	171%	104%
Greenup	7.12	10.82	21.11	51%	95%
Harlan	4.65	18.41	47.82	295%	159%
Jackson	3.27	5.08	10.39	55%	104%
Johnson	5.31	11.55	19.52	117%	69%
Knott	2.90	6.98	18.39	140%	163%
Knox	5.18	9.93	15.22	91%	53%
Laurel	4.51	8.26	15.23	83%	85%
Lawrence	4.84	7.77	14.54	60%	87%
Lee	4.51	6.67	12.85	47%	92%
Leslie	2.50	6.90	12.28	176%	76%
Letcher	3.58	6.43	25.32	79%	295%
McCreary	.....	.....	6.70	.....	.....
Magoffin	4.68	8.03	17.01	71%	111%
Martin	4.12	7.15	11.79	73%	64%
Menifee	4.64	5.74	8.73	23%	52%
Morgan	4.55	8.60	14.57	89%	81%
Owsley	4.38	6.65	13.90	51%	109%
Perry	2.85	7.13	17.14	150%	140%
Pike	3.23	8.82	19.31	170%	117%
Powell	5.18	15.89	18.30	206%	15%
Pulaski	5.78	7.86	22.58	36%	187%
Rockcastle	5.54	7.45	15.51	34%	108%
Rowan	3.24	4.39	10.10	35%	107%
Wayne	3.69	8.96	17.31	142%	93%
Whitley	5.05	8.68	13.82	71%	59%
Wolfe	4.85	7.65	12.76	57%	66%
Average for the mountains	4.43	8.82	17.37	99%	97%
State average	13.24	21.83	48.62	64%	122%

Based on data from U. S. Census.

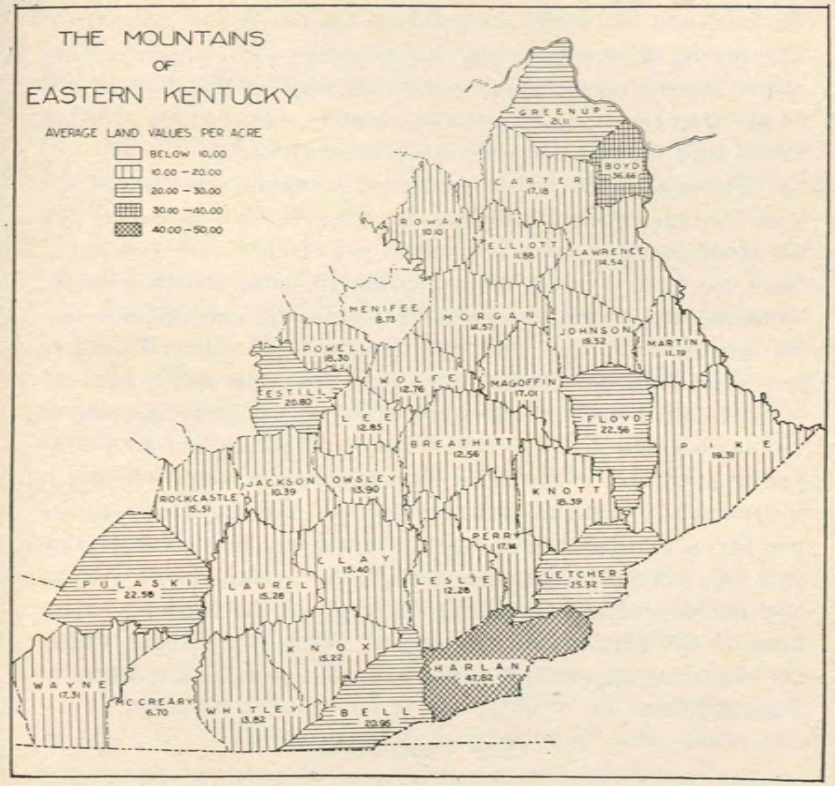

FIG. 9. AVERAGE LAND VALUE PER ACRE.

valuation for such an average farm was $1,195[4] and the market value was approximately the same.[5] From this average farm, the gross returns from all crops were $1,437.55, and from all sources, $1,574.16.[6] This was in 1919, when prices for farm products were much higher than at present, this being particularly true for corn, which comprises nearly 50% of the total value of the production. The total gross revenue from such an average farm certainly would not exceed $1,000.00 with present prices and probably would be much less. This is an average condition; on many farms, the returns are much less. If expenditures incurred in raising the crops and a fair return on the market value of the land are deducted from the gross returns, the labor return is unsatisfactory, or if a fair labor return is subtracted, in addition to the other expenses of the farm,

the land will not yield a reasonable return on the investment. The owning of such land and the utilization of it for agriculture under present conditions is justifiable only on the basis of the prospective return due to the speculative value which attaches to the land, due to the underlying mineral wealth.

The explanation of the continued occupancy and use of the land for agricultural purposes is, however, far different. In the more remote areas, in counties of which Knott is a type, there has been a great disinclination to move to other areas. Consequently, as population has expanded by natural increase, the pressure on the land has increased greatly. This has had the effect, previously noted for this area and prevalent in many other parts of the state, of causing a great increase in the number and decrease in the size of the farms and an accompanying increase in the price of land, irrespective of whether it is particularly well suited for agricultural use, together with the use for agricultural purposes of much non-agricultural land. It is this which is responsible for the low average gross returns and the unprofitable character of many of the farming operations in all portions of the area. With the changes which are occurring at present, there will be a marked alteration of this condition.

Crop Production

One of the striking features of the agricultural occupation is the continually changing boundary of farm and forest. In the creek bottom settlements, the bottom lands are permanently agricultural in character, but the use of the slopes changes. Originally forested, clearing renders them available for temporary use in crop production. Later, with abandonment of the field, the forest repossesses the area. Farms are permanent peninsulas of cultivated land, with changing margins, extending into the forest. (See Pls. VI, IX and XXIV). Here and there, man has added to the extent of his holdings by clearing, but to match this, the forest has invaded the former cultivated area and claimed the ground again. The entire process of clearing and recapture by the forest is brief because of the short life of the slopes under cultivation and the rapidity of tree growth in this area with its abundant rainfall and long growing season.

In the area of ridge top settlement, the farms are ridge top islands (See Pl. V) of changing outline and area. Occasionally, through abandonment, the cleared area reverts in its entirety to forest; again, the change may be marginal only, as in the area of creek bottom settlements. Everywhere, the forest encroaches on the cultivated fields, in places retreating before the advance of agriculture, again advancing and repossessing the area from which it has been forced to retreat temporarily by man's activity in clearing.

Approximately half of the improved land is under crop. (14th Census). In reality, a somewhat larger fraction of the actually available land is cropped because abandoned fields, used as pasture though not available for cultivation, are listed as improved land until the forest again takes possession fully.

The mountain farmer is, even today, only in small degree a commercial producer. He has been and still is content to practice self sufficiency in his operations. This has been of fundamental importance in determining the crops grown in the past and it is necessary to appreciate this fact to understand present conditions. In the past, poor roads and the absence of rail transportation made it necessary that the products of the farm should suffice for the needs of the farmer. In consequence of this fact, within the climatic limitations of the area, crops were raised which would meet adequately the needs of the community. In the Mountains, on account of isolation, there is present the agricultural economy of colonial days, almost unmodified. Climate, soils and topography have helped to determine the distribution of the various crops within the area or on a given farm, but their influence in this respect has been neither so marked nor so important as it is in areas of lesser isolation and with a different historical background.

No particular crop is associated with any definite soil type, a given crop being raised on a great variety of soils. The more desirable and deeper alluvial soils naturally give better yields than do the thin and often sandy soils of the ridges, but with minor variations, the same crops are raised on both soil types. Steep slopes, it is true, are normally given over to either corn or grass, but it is the topographic difficulty of small grain cultivation which restricts the use of the land rather than the thinness, physical character or chemical composition of the soil.

Sufficient uniformity of temperature conditions prevails so that temperature differences are reflected in the agricultural economy in only a minor way. All portions of the area have a frost free season of 150 days or more,[7] a period of sufficient length to insure general freedom from frosts for all crops grown, except in very limited local areas of deficient air drainage. The summer days are hot, temperatures of 107 degrees being known, and in the late growing and fruiting season, days are generally clear. Although temperatures of —22 degrees occasionally occur, prolonged cold periods are uncommon.[8] Crops mature long before the occurrence of the first frosts in the fall, so that the stimulus of approaching cold weather is lost, but it is probable that the dry weather which prevails in the late summer and early fall, has the same effect upon fruiting habits and crop yields as does the cold of the higher latitudes.

The warm, moisture laden winds from the south and southwest bring from 42 to 50 inches of rainfall, well distributed throughout the year. This sufficiency of rainfall and its favorable distribution, with a maximum occurring during the growing season of late spring and early summer, and a minimum during the fruiting and harvesting season, which occurs in the late summer and early fall, is of great importance to agriculture. Snow comprises only a small fraction of the total precipitation, on the average not to exceed 3%, which is a very small amount. Crops are not fall planted; winter snow is important only as it supplies moisture for crops during the growing season. Winds are seldom of destructive violence and crops suffer little from that cause.

The climate is a rather desirable variety of the humid continental type, characterized by favorable temperature conditions, an abundant and well distributed rainfall and an absence of destructive winds. From the climatic standpoint, conditions are favorable for a large and varied crop production in the Mountains.

Cereal Production

Corn is the most important cereal crop in the Mountains, being grown in many of the more isolated counties to the practical exclusion of the small grains such as wheat and oats. In 1909, corn constituted 96% of the entire cereal production,

and in 1919, it amounted to 91% of the total cereal crop, expressed in bushels. In certain of the more isolated counties, corn constitutes an even larger fraction of the total cereal crop. In 1909, for example, corn comprised 99% of the total cereal crops of Knott and Harlan counties, and in 1919, an almost equally large percentage of the total cereal crop in Breathitt and Perry counties. In all parts of Kentucky, corn is one of the two major crops, but in the Mountains, it is *the* major crop. In other portions of the state, there is normally a cash crop such as tobacco or cotton, but in the Mountains, a distinctive cash crop is lacking and corn occupies the major portion of the small amount of effort put forth by the mountain farmer.

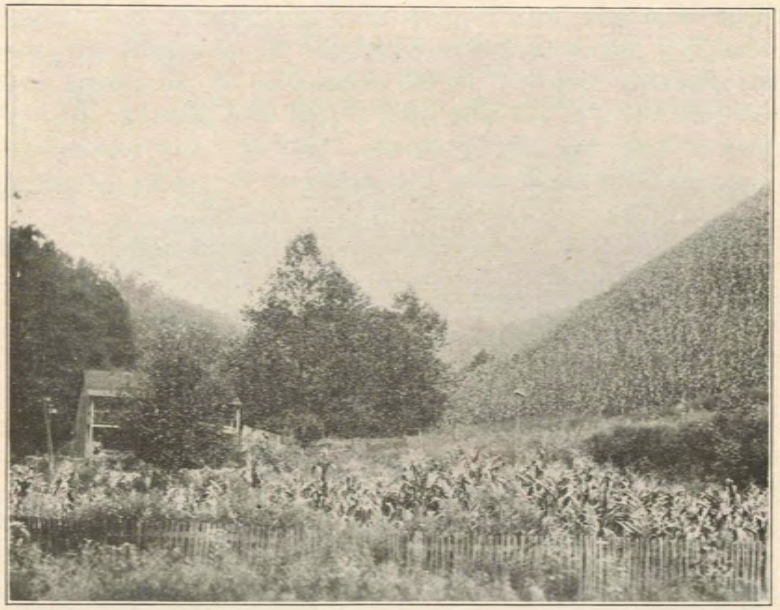

PLATE XVII. CORN ON A CREEK BOTTOM AND ON THE ADJOINING STEEP SLOPES.
Frozen Creek in Breathitt County.

The cultivation of corn is so general that it is grown under a wide variety of topographic and soil conditions, with a consequent wide variation in yield. Corn pre-empts a large fraction of the bottom lands. Along the larger rivers, the bottoms are of considerable width and the soils are deep and of high fertility.

Such bottoms are given over largely to corn. Under those conditions, it makes a very good growth, corn ten to twelve feet in height being not uncommon. Corn is likewise grown on the bottom lands bordering the smaller creeks to the practical exclusion of all other crops. (See Pls. VIII and IX). On the steeper slopes, it is virtually the only crop. (See Pls. VII and XVII).

The bottom lands have been cleared for a period of sufficient length to eliminate all evidence of the former forest cover, but in the newer fields on the slopes, corn is frequently grown in a "deadening" between trees killed by girdling. (See Pl. XVIII.) The slopes on which corn is grown are often so steep that practically all work on the crop must be done by hand or at best, with a single mule and plow. Corn is sometimes both planted and worked by hand, though a mule and plow are generally employed in the preparation of the ground and for cultivation of the crop after it has been planted. By the first of July, the crop is usually "laid by" and requires no more attention until about the middle of September. Corn is

PLATE XVIII. CORN IN A "DEADENING."
McCreary County, in the area of Ridge Top Settlements.

cut with a hand knife and shocked by hand. Husking and hauling of the corn are done in the late fall and early winter. Sometimes the leaves are stripped from the stalk and stacked for fodder (See Pl. XIX) and the ears of corn are later harvested from the stalks. This is known locally as "blading and topping." It is the more desirable method of harvesting as it saves both corn and fodder, but as it involves more work, it is the less common practice.

Average yields for the Mountains are not high. On the better alluvial soils, corn may be considered as entitled to a place in the farm economy on the basis of yields, but on the thin and often sandy ridge soils, and on the slopes, the reasons for growing corn are somewhat different. To understand the great predominance of corn as a cereal crop, it is necessary to consider the inherited traditions of mountain agriculture as well as present climatic, topographic, soil, and transportation conditions.

PLATE XIX. CORN "BLADED" AND LEAVES STACKED FOR FODDER.
The ears still remain on the stalk to be harvested later. McCreary County, an area of ridge top farms.

CORN.

Counties	Bushels Per Sq. Mi. of Land Surface		Bushels Per Sq. Mi. of Improved Land	
	1909	1919	1909	1919
Bell	496	615	3,559	4,248
Boyd	1,495	962	2,777	1,932
Breathitt	1,093	1,122	4,455	3,971
Carter	1,592	1,201	3,057	2,655
Clay	1,324	1,378	3,911	3,854
Elliott	1,515	1,255	2,884	2,515
Estill	2,159	1,938	5,102	5,160
Floyd	1,570	1,972	4,498	5,736
Greenup	1,415	1,376	3,230	3,493
Harlan	326	437	3,443	3,685
Jackson	976	1,101	2,641	2,940
Johnson	1,739	1,617	3,112	2,998
Knott	1,069	1,263	4,560	4,306
Knox	1,347	1,609	3,043	3,659
Laurel	917	1,075	2,638	2,980
Lawrence	1,742	1,244	3,012	2,214
Lee	1,301	1,151	4,496	3,713
Leslie	742	896	4,455	4,609
Letcher	853	811	3,600	3,750
McCreary	.....	311	.....	2,957
Magoffin	1,587	1,540	3,413	3,142
Martin	765	775	4,230	4,144
Menifee	1,038	949	3,421	3,027
Morgan	1,704	1,494	3,356	2,731
Owsley	1,348	1,708	3,641	3,856
Perry	1,049	852	4,618	3,770
Pike	1,107	1,091	4,368	4,083
Powell	1,431	1,321	4,363	4,843
Pulaski	1,415	1,964	2,853	3,916
Rockcastle	1,387	1,766	4,068	4,029
Rowan	899	960	3,688	4,011
Wayne	1,146	1,362	2,698	3,551
Whitley	1,073	1,016	2,504	2,753
Wolfe	1,528	993	2,903	1,967
Average for the Mountains	1,185	1,212	3,405	3,471
State average	2,761	2,369	3,716	3,275

(Based on data from U. S. Census.)

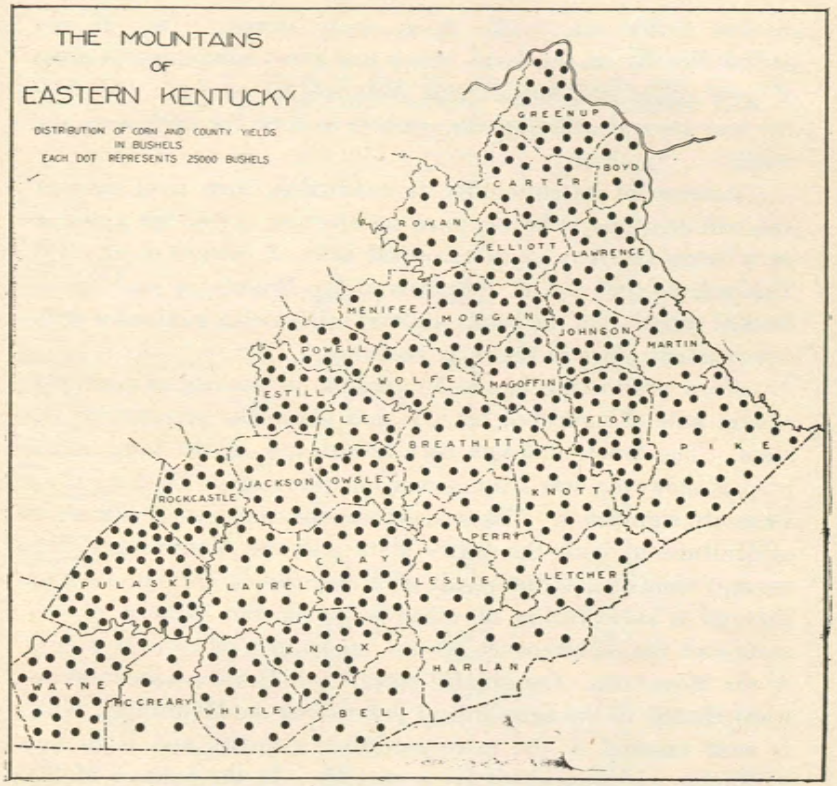

FIG. 10. DISTRIBUTION OF CORN AND COUNTY YIELDS IN BUSHELS.

The Mountains were settled shortly after the colonial period by settlers from southern states. The pioneers came from an area where corn was a major crop and the chief reliance for food. They settled in an area admirably adapted to growing corn but not small grains, and consequently corn early became the principal cereal crop. Isolation perpetuated the practice of growing corn to the exclusion of all else so that the practice has persisted to the present. Conditions still make it the most desirable major crop for the area because of the following facts: (1) Corn requires few and inexpensive tools for planting, cultivating, and harvesting. (2) On many of the farms, machinery could not be used to good advantage, even though the cost were not prohibitive. (3) Corn gives larger yields than the small grains. (4) It yields fairly well with

careless cultivation. (5) It is easily stored. (6) It can be fed directly on the farm, which is a great advantage in areas of poor roads and considerable distances to market. (7) It is the best general utility grain, serving as food for both man and stock.

Because of its suitability to conditions, corn is at present and will continue to be the most satisfactory cereal for growing on a large fraction of the cropped area of eastern Kentucky. This will be true for all portions of the Mountains and for all the soil types. On the better alluvial soils, yields guarantee corn a permanent place in the farm economy.

Corn production in the Mountains, in bushels of corn per square mile of improved land, is now above the average for the state. The fraction which corn constitutes of the total cereal crop is, however, less than it was ten years ago. Both of these facts are significant. Taken together, they indicate a change in agriculture in both the entire state and the Mountains. The present condition is the result of a decrease in corn production through a substitution of other crops in the balance of the state and the maintenance of the importance of corn as a crop in the Mountains. Conditions, however, indicate a tendency toward change in the agricultural practice in the Mountains. This is most marked in the more accessible counties and is in line with other changes which are occurring. In the balance of the state, crops such as tobacco have absorbed a greater proportion of the cropped area and reduced the size of the corn crop. In the Mountains, this has not been true, but even there, to a limited extent, the small grains have gained a foothold in the agricultural system.

Small grains do not, however, occupy an important place in the farm economy. Climate, soil and topographic conditions favor corn at the expense of the small grains. Farms are small; fields are both small and irregular in shape. On the slopes, the use of machinery is impossible, and on the bottom lands, it is impracticable. The lesser labor requirement of the small grains is not a factor, in view of the density of population and the greater per acre yield of corn. The abundant and well distributed rainfall, the hot summers, and the large amount of bottom land and steep slope under cultivation all tend to restrict the area given over to oats, wheat, rye and barley.

OATS.

Counties	Bushels Per Sq. Mi. of Land Surface		Bushels Per Sq. Mi. of Improved Land	
	1909	1919	1909	1919
Bell	5.0	14.6	36.4	100.8
Boyd	87.7	129.1	162.9	259.1
Breathitt	9.2	27.4	37.6	97.2
Carter	50.3	122.8	96.6	271.6
Clay	11.5	52.1	34.0	146.4
Elliott	63.4	178.3	120.7	357.1
Estill	23.3	30.2	55.2	80.6
Floyd	6.6	18.1	19.0	52.6
Greenup	29.1	79.9	66.5	202.9
Harlan	1.5	4.7	10.0	40.4
Jackson	36.7	117.2	99.2	313.1
Johnson	36.2	118.2	64.8	219.2
Knott	1.2	5.4	5.1	18.6
Knox	16.0	36.5	36.2	83.0
Laurel	30.0	121.9	115.2	337.8
Lawrence	44.0	142.6	76.2	253.8
Lee	28.3	96.3	98.0	306.3
Leslie	.8	14.1	5.3	72.8
Letcher	3.2	12.3	13.8	55.2
McCreary	.....	15.6	.....	150.9
Magoffin	6.0	61.4	12.8	125.3
Martin	2.4	5.5	13.5	29.4
Menifee	36.3	115.0	119.7	366.7
Morgan	41.6	196.2	82.0	358.7
Owsley	38.6	125.7	104.4	284.2
Perry	3.5	11.0	15.6	48.9
Pike	7.3	24.6	28.7	92.5
Powell	13.2	20.3	40.4	74.6
Pulaski	90.8	185.2	183.2	369.2
Rockcastle	31.4	142.9	74.7	326.2
Rowan	25.0	114.3	102.5	477.8
Wayne	49.0	71.7	115.3	186.9
Whitley	28.2	57.9	65.7	157.3
Wolfe	36.0	160.9	68.4	318.8
Average for the Mountains	26.3	74.1	74.7	212.7
State average	59.8	69.4	107.2	127.8

(Based on data from U. S. Census.)

The 1919 oat crop in the mountain counties was almost double the wheat crop in bushels, whereas for the entire state, the wheat crop was nearly four times the oat crop in volume. Although the climate of Kentucky is not particularly well suited to the growing of oats because of the warm humid days and nights, the climate of the Mountains is better adapted to growing oats than that of any other portion of the state, as the nights are much cooler than elsewhere in the state and there is more fog and mist during the growing season, especially on the higher elevations. This is in large part responsible for the greater importance of the oat crop in this area than in other portions of the state and it is also a factor in determining the distribution of the oat crop within the area.

Disregarding the counties of the western border whose agricultural economy is quite different from that of those counties lying wholly within the Mountains, the major portion of the oat crop is grown in two areas: (1) the counties of the northern portion where relief is less and (2) the area of the ridge top settlements. This was particularly noticeable in 1909, at that time oats practically disappearing as a crop in counties such as Breathitt, Knott, Harlan and Perry, where settlements are along the creeks and the bottom lands are pre-empted by corn to the practical exclusion of all other crops. The localization of the oat crop in this manner is due to topography as well as to climate. In the section with larger amounts of relatively level land, it is practicable to grow small grains. In part, and this is particularly true of the ridge top areas, the greater amount of fog and mist also favors the growing of oats.

One of the most striking characteristics of the growing of oats has been the rapid increase in the acreage grown. In 1909, the remote counties of the creek bottom settlements grew hardly any, which made the average per square mile of improved farm land for the entire area somewhat less than the state average, although for many individual counties, it was distinctly above the state average, even in 1909. Within a period of less than ten years, however, the Mountains have passed the state average. This is probably due to slightly improved farm practice in the border counties, as the state production has not decreased. The more remote mountain counties, as Knott, Perry and Leslie, are still small producers of oats.

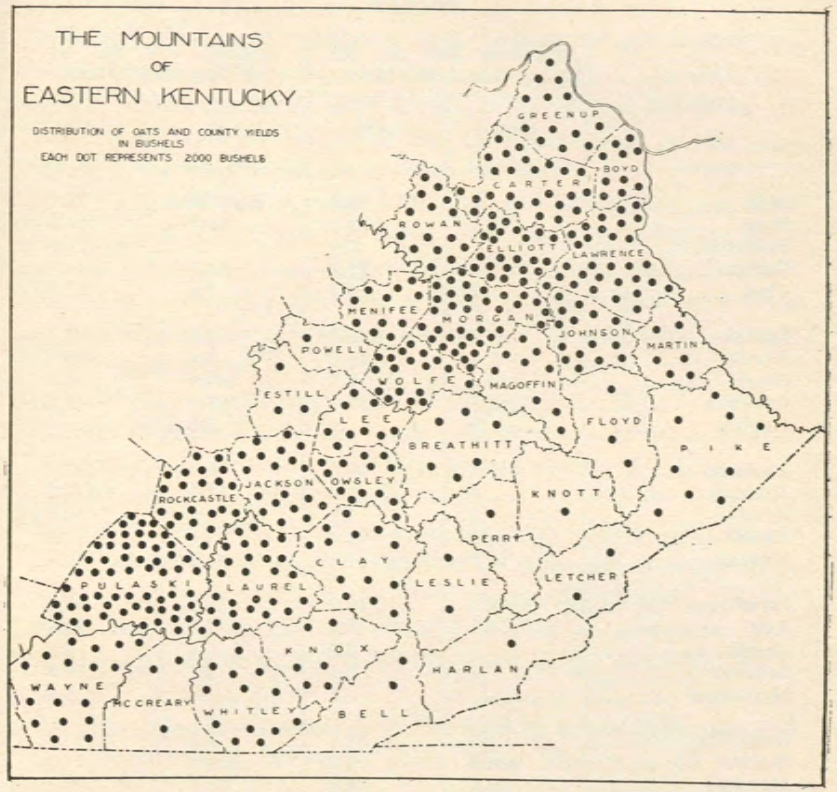

FIG. 11. DISTRIBUTION OF OATS AND COUNTY YIELDS IN BUSHELS.

Although wheat ranks third among the cereals produced, it comprised only 1.6% of the total 1909 cereal crop and only 3.2% of that of 1919. Neither climate nor topography favors wheat, and in addition, it has to overcome the inherited prejudice in favor of corn. Further, the soils of the bottoms are well suited to corn and give good returns with that crop, though but indifferently suited to the growing of wheat. In view of these facts, wheat cannot assume any important place among the crops of the area.

There has been, however, a marked increase in the amount of wheat raised during the past decade, the increase amounting to a trifle over 100%, a percentage of increase considerably greater than that for the state as a whole. If the production of

WHEAT.

Counties	Bushels Per Sq. Mi. of Land Surface		Bushels Per Sq. Mi. of Improved Land	
	1909	1919	1909	1919
Bell	.1	2.3	.9	16.1
Boyd	43.6	58.1	81.1	116.6
Breathitt	.1	5.0	.5	17.8
Carter	22.0	91.1	42.3	201.4
Clay	2.5	9.7	7.4	27.3
Elliott	29.7	115.4	56.7	231.4
Estill	1.5	10.0	3.6	26.8
Floyd	none	7.7	none	22.4
Greenup	47.7	131.7	108.9	341.8
Harlan	.8	.4	5.2	4.0
Jackson	3.0	50.6	8.1	151.2
Johnson	.5	63.2	1.0	117.2
Knott	.1	1.1	.5	3.8
Knox	.7	6.5	1.5	14.9
Laurel	15.3	57.8	44.2	160.4
Lawrence	32.5	53.2	56.2	94.7
Lee	3.4	18.3	11.8	59.0
Leslie	.1	1.9	.6	9.8
Letcher	.5	2.4	2.2	10.9
McCreary	.....	.9	.....	8.0
Magoffin	1.5	33.7	3.3	68.8
Martin	none	2.0	none	11.1
Menifee	10.8	28.8	35.7	91.7
Morgan	8.8	94.8	17.5	173.3
Owsley	5.3	42.3	14.3	95.6
Perry	none	1.3	none	5.9
Pike	.02	4.3	.1	16.3
Powell	2.0	2.4	6.2	8.8
Pulaski	147.3	163.6	297.1	336.2
Rockcastle	85.5	99.2	204.2	226.4
Rowan	3.7	68.2	15.4	285.1
Wayne	111.2	120.5	261.8	314.2
Whitley	1.0	11.2	2.4	30.4
Wolfe	7.9	57.2	15.0	113.4
Average for the Mountains	20.4	43.0	58.6	123.5
State average	289.0	389.0	343.0	475.0

(Based on data from U. S. Census.)

the border counties of Boyd, Greenup, Carter, Elliott, Rowan, Jackson, Rockcastle, Pulaski, and Wayne is subtracted, the total remaining production of wheat is negligible. As with oats, wheat production is located in the areas of less relief, in the more level lands of the ridge top settlements and on the level lands of the counties of the western border.

The other small grains as barley, rye and buckwheat, have a negligible production, the total 1909 production for all three amounting to less than .5% of the total cereal production and the 1919 production was only a trifle greater. The production of these minor cereals shows no promise of extensive increase in the near future.

Sorghum is an important minor crop in the Mountains, commonly grown on bottom lands as it does well under the same general conditions as corn. It is grown largely for the syrup. The State of Kentucky ranks third among the states of the United States in the production of sorghum syrup. Out of the total acreage in the state devoted to the growing of sorghum in 1919, 22,196 acres of 44.4% were in the Mountains. Of the total state production of 2,044,098 gallons of syrup in 1919, 961,108 gallons or 47.1% were produced in the mountain counties.

The juice is extracted from the cane by crude mills operated by horsepower as shown in plate XX. This type of mill is not confined to the Mountains, but represents a usual device for pressing out the juice. After extraction, the juice is boiled in open pans and then strained. The syrup produced is commonly known as "long sweetening."

The growing of sorghum for syrup is not uncommon in many portions of Kentucky, but sorghum becomes more important as a crop in the more isolated areas and its growth as a crop is commonly associated with other evidences of retardation. The growing of sorghum for syrup represents an attempt at self sufficiency on the part of the individual farmer. In pioneer communities in the United States, wherever climatic conditions have permitted, sorghum has usually been grown, but with the development of the area and the improvement of means of communication, it has tended to disappear. In the Mountains, a relatively high degree of isolation still persists, hence this crop still holds its place in the farm economy.

PHOTOGRAPH BY R. S. ALTER

PLATE XX. A SORGHUM MILL IN OPERATION.
McCreary County near Cumberland Falls.

Hay and Forage Crops

Hay and other forage crops occupied 33% of the cropped area in 1919, ranking next to cereals in the acreage devoted to their production. The cereals, together with hay and other forage crops, occupied 95% of the total cropped area in 1919, and of the area devoted to cereals, 88% was in corn, so that 83% of all land cropped in that year was given over to either corn and hay or some other forage crop.

Of the various forage crops, corn ranks first with 68% of the area devoted to growing forage crops used for its production. Various tame grasses, principally timothy, make up 23.5% of the acreage, clover and alfalfa 2%, wild grasses 1.6%, and the balance of the acreage, or less than 5%, is devoted to small grains, legumes, silage crops, sorghum and root crops used as forage. The constitution of the forage crop is striking in three particulars: (1) the predominance of corn, (2) the small amount of clover, (3) the almost negligible amount of alfalfa grown, none being reported by eleven counties in 1919. The total acreage for all the mountain counties was only 358, or .6% of the total state acreage. These characteristics of the makeup of the fodder crop re-emphasize the importance of corn which is raised both as a cereal and a fodder crop and show the slowness with which change is occurring in agricultural practice. The border counties show considerable clover and some alfalfa grown. Pulaski County, for example, grew 3,645 acres of clover out of a total for the Mountains of 9,369 acres. In the same year, Breathitt, Knott, Leslie and Whitley counties grew 39, 19, 6, and 39 acres respectively. Similar differences are shown in the acreages devoted to alfalfa. Changes in agricultural practice and in crops raised occur but slowly, especially in the more remote mountain counties.

PLATE XXI. VIEW ACROSS THE VALLEY OF ONE OF THE FORKS OF GREASY CREEK.
Harlan County. View from the lower portions of the north slope of Pine Mountain.

Plate XXI is a typical view across the valley of a creek in the area of creek bottom settlements and shows graphically that practically all the cropped area is given over to the produc-

tion of either corn or some forage crop which may also be corn. The field in the foreground, which in part represents the stony lower slope of Pine Mountain, formerly cleared and cropped but no longer utilized except for some scanty pasture which it may afford, is devoted to hay, which has been cut and put up in numerous small stacks scattered over the field along the creek. In the background, corn covers the bottom land and the lower portion of the opposite slope. Fields devoted to other crops are lacking, and even though present, would constitute a negligible portion of any typical mountain landscape.

Hay barns, common in northern states, are lacking. Corn, used for fodder, is commonly stacked as shown in Pl. XIX. Sometimes it is bladed as shown, and again the corn is cut for fodder and fed from the stack. Hay is also stacked in the field as shown in Plate XXII. The stacks are very small and are secured by poles to prevent damage by wind. Few of these stacks exceed eight or nine feet in height and they are commonly in groups as shown in Pls. XXI and XXII. The writer has seen as many as seventeen of these small stacks in a field not to exceed fifteen acres in size. The large number and the small size of these stacks is doubtless the result of the amount of hand labor involved in harvesting and stacking the hay.

Vegetables and Miscellaneous Crops

Vegetables and miscellaneous crops occupy somewhat less than 5% of the cropped area and comprise a similarly small percentage of the total value of the crops produced. In general, there is a tendency toward an increase in such crops in the border counties, especially in the northern and northwestern portion of the area under discussion.

Tobacco is the most important of the minor crops, with a total of 22,996 acres devoted to its production and a crop of 8,058,281 pounds in 1919. This was, however, only 1.5% of the total state production in that year, seventeen counties producing individually in excess of the entire production for the Mountains. Graves County alone produces nearly three and one-half times as much tobacco as all the mountain counties with over twenty-two times the areal extent. In the mountain counties proper, only a small amount of tobacco is raised. In these counties, the crop

represents the growing of tobacco for local needs only, the 1919 crop for McCreary, Letcher, Harlan, Bell and Wolfe counties being only 480, 2,402, 1,799, 625 and 5,306 pounds respectively. Of the border counties, however, many produce a small surplus. For example, Greenup, Carter and Menifee counties in 1919 produced a total of 4,686,889 pounds or 56% of the total production of the thirty-four mountain counties. Tobacco is not now and will not be in the future an important crop in the Mountains. It is primarily an upland crop and is grown on soils of different character than most of those of the mountain counties and hence cannot be expected to displace present crops to any considerable extent.

Of the vegetables, Irish potatoes, sweet potatoes and yams are the most important as regards the acreage under cultivation and the value of the crop. In 1919, a total of 1,135,694 bushels of Irish potatoes were produced. Though not a very large production, it was 36% of the state total. Sweet potatoes and yams are also raised in considerable quantities, the 1919 crop of 608,263 bushels representing 49% of the total state production. Crops other than those specifically enumerated are of very minor importance, occupying less than 1% of the cropped area.

The expansion of the area devoted to truck gardens would be highly desirable, especially in those counties where the mineral wealth has been developed. Fresh vegetables of good quality are often high in price and not always obtainable. Markets would probably have to be established to absorb the production, but with the rapidly increasing population of the coal mining communities, this should be possible, and from the standpoint of the mining communities, highly desirable.

Fruits and Nuts

Over 36% of the bearing fruit trees of the entire state are in the mountain counties. Of these, apple trees constitute 66%, peach trees 28%, pear trees 1.4%, plum trees 3%, and cherry trees 1%. Yields do not, however, exceed the state average, and in the case of peaches, fall far below. In addition to low yields, much of the fruit is also poor in quality as many of the trees are "volunteers." In the Mountains proper, there are no com-

mercial orchards. There should be an expansion of the industry to care for local needs adequately. This is particularly true for the areas near the coal mining districts where local markets would absorb a greater quantity of fresh fruit if it were available at reasonable prices.

It is impossible to determine with any degree of accuracy either the volume or value of the nut crop, but it is even at present of appreciable value, and what is more significant, could be expanded to supplement farm incomes to good advantage. Walnut, several valuable varieties of hickory, chestnut and English walnut grow wild in the hills. It should be possible to grow these trees on much land at present of relatively little value to supply both lumber and an annual crop of nuts. Small individual operations would not pay, but cooperation should insure the success of the venture. The product would stand shipping without deterioration and the value of the nuts would allow them to be marketed over a wide area.

Animals and Animal Products

The mountain counties make a poor showing by comparison with other portions of the state in the number of cattle, sheep, swine, horses and mules per square mile of land surface, falling distinctly below the state average in all of the animal industries. This is due to the smaller percentage of improved land in the mountain counties. When this factor is taken into consideration, the situation is altered as shown in the accompanying tabulation, the mountain counties in many cases passing the state average as to number of animals per square mile of improved land.

NUMBER OF ANIMALS PER SQUARE MILE OF LAND SURFACE
1919.

	Cattle	Sheep	Swine	Horses	Mules
The Mountains	22+	7+	23+	4.5+	4.9+
The State	27+	17+	37+	9.5+	7.2+

NUMBER OF ANIMALS PER SQUARE MILE OF IMPROVED LAND
1919.

	Cattle	Sheep	Swine	Horses	Mules
The Mountains	63+	20+	67+	12+	14+
The State	50+	32+	68+	17+	13+

Reference to Fig. 12 will indicate the distribution of cattle. As would be expected, the areas of larger crop production and more diversified farming in certain of the border counties show the greatest number per square mile. In the Mountains, however, the number of cattle per square mile of either total or improved land surface is not an accurate measure of the importance of the industry because most of the cattle are scrub stock of low value. Further, much of the stock runs in the woods during the summer and consequently is in poor condition. Optimum

PLATE XXII. PASTURE ON BOTTOM LAND.
The hay has been cut and stacked in the characteristic small stacks. Leatherwood Creek in Perry County.

conditions in pasture land are shown in Plate XXII. Even under the best conditions, stock is poorly cared for as there are few barns and outbuildings. There is much need for more stock in order to help maintain soil fertility. This fact is recognized and the county agricultural agents are, in many cases, making a special effort to improve the quality of the stock as well. There is also need of a more extensive dairy industry as the supply of milk, cream and butter is inadequate, even for local needs.

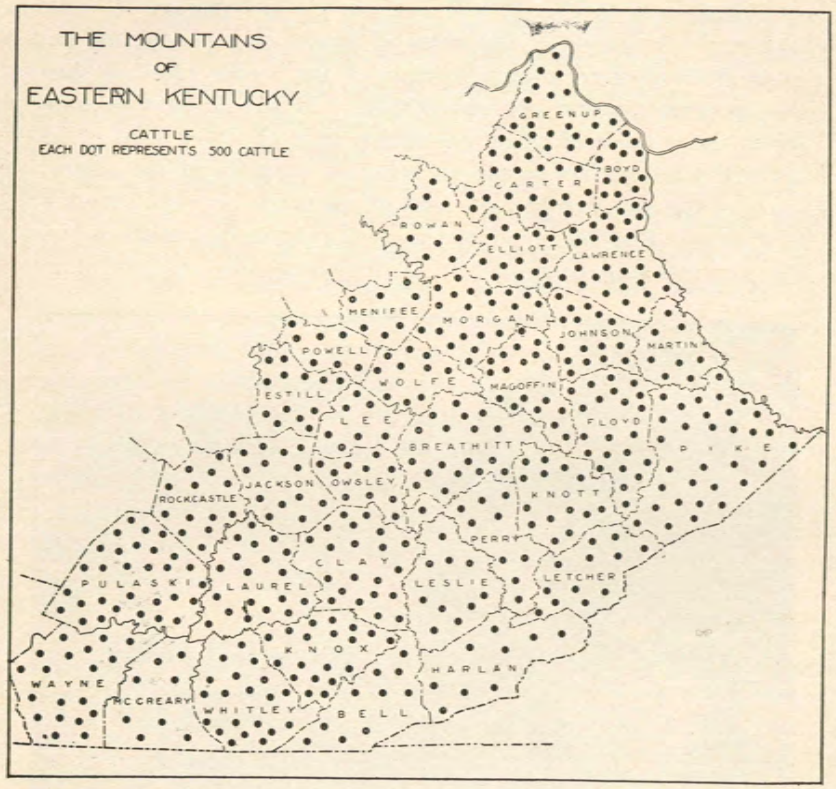

FIG. 12. DISTRIBUTION OF CATTLE.

As is normally the case in an area where corn is the major crop, hogs are raised in large numbers, the number per square mile of improved land closely approaching the average for the state. The number of hogs per square mile in the various counties for 1919 is shown graphically in Fig. 13. No conclusions can be drawn from present distribution as the number of hogs varies too greatly from year to year in a given county. In McCreary County, for example, there were 5,865 hogs in 1918, 8,231 in 1919, and 5,243 in 1920.[9] Such considerable changes in number are in some cases related to variation in corn crop and the price of pork, in other cases, they are occasioned by decreases due to disease. As in the case of cattle, improvement in the type of hog raised is desirable, especially in view of the fact that as

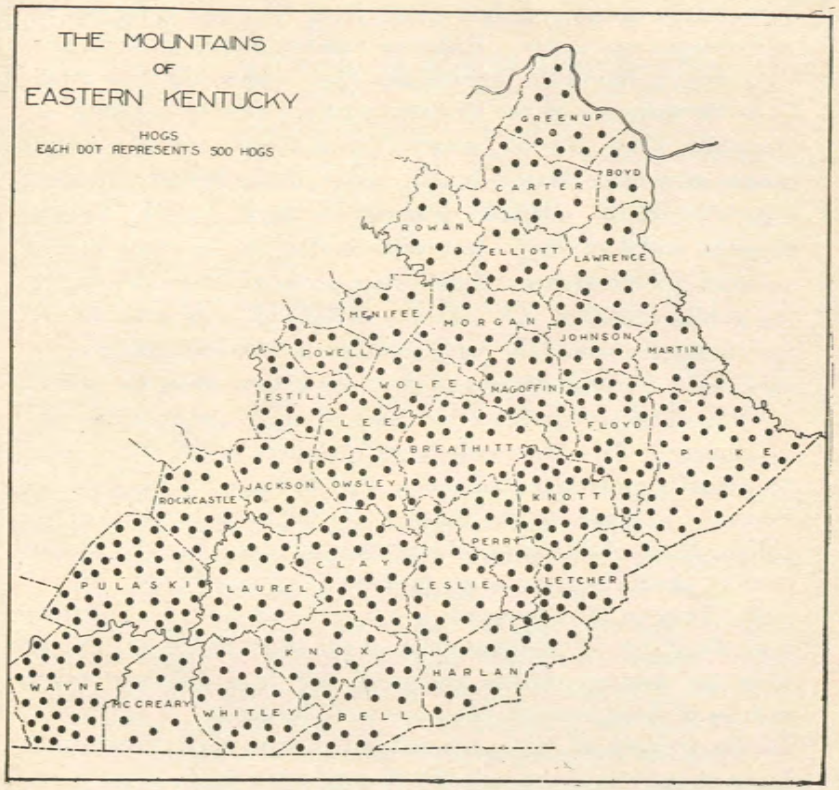

FIG. 13. DISTRIBUTION OF HOGS.

long as corn remains the staple cereal crop, the raising of hogs may be expected to continue to be one of the major animal industries of the mountain counties.

Sheep are relatively few in number, and in some counties, practically disappear. For square mile of land surface, the number is only 40% of the state average; for square mile of improved land, it is 62% of the average for the entire state. No considerable expansion of the sheep raising industry can be expected under the climatic, topographic and soil conditions which point to a different type of animal industry in connection with crops which can be raised to good advantage.

In 1919, the mountain counties had a total of 54,813 horses and 60,208 mules or an average of 4.5 horses and 4.9 mules per

square mile as against state averages of 9.5 and 7.2 for horses and mules respectively. Mules outnumber horses as draft animals everywhere in the Mountains. This is especially true away from the counties of the western border. In counties such as Breathitt, Clay, Harlan, Knott, Knox, Leslie and McCreary, mules outnumber horses, but in many of the border counties, especially of the northern portion, as Boyd, Carter, Elliott, Greenup and Lawrence, the reverse is true, horses being in the majority. Both horses and mules are pressed into service under the saddle (See Pls. XXVIII and XXXVIII,) as most of the travel over the mountain roads is either on foot or horse or mule back and the mountaineer seldom walks except when necessary.

Considerable attention has been given to the improvement of poultry. This has resulted, as elsewhere in the state, in a somewhat greater egg production, though there has been no appreciable increase in the number of the poultry. In Carter, Elliott, Estill, Johnson and Lawrence counties, the value of the poultry products rises to an average of over $360 per square mile. Even in these counties, however, this is only a small fraction, about 3%, of the total value of the crops produced. Conditions for poultry raising are good, and to supplement other sources of farm revenue, the revenue to be derived is important. In the vicinity of mining communities especially, there could be an expansion of the industry to good advantage.

This survey of the use of the land in the Mountains of Eastern Kentucky shows the non-agricultural character of much of the land, even of that which is cropped at present. It shows a shrinking area of improved land with further decrease in prospect and a relatively small area, probably not to exceed 20% of the total land surface, which may remain in permanent use for crop production. Agricultural conditions in the Mountains are in reality even poorer than has been pictured in this survey, as many border counties, which lie only in part in the area, have been included in arriving at average crop production. The relative unproductivity of the area is brought out in the accompanying tabulation, showing production of the principal crops and the distribution of live stock per square mile of land surface in three typical mountain counties as contrasted with three counties which lie only in part in the area.

AGRICULTURAL CONDITIONS IN 1919.

Typical Border Counties	Crop Production in Bushels Per Square Mile of Land Surface			No. of Animals Per Sq. Mi. of Land Surface	
	Corn	Oats	Wheat	Cattle	Swine
Pulaski	1,964	185	168	26	31
Rockcastle	1,766	142	99	22	27
Wayne	1,362	71	120	20	34
Mountain Counties					
Harlan	437	4.7	.4	10	14
Leslie	896	14.0	1.9	15	20
Whitley	1,016	57.0	11.2	22	21

In spite of the poor showing which agriculture makes at the present time, it should be borne in mind that the agricultural resource, even though limited in value, can be made one of the few permanent assets, if farming is carried on wisely and with due regard to the opportunities and limitations of the area. Mineral wealth is exhaustible, and when gone, cannot be replaced, but agriculture can be carried on indefinitely if practiced under proper restrictions. In the formation of any plan for the introduction of a permanent agricultural program, the large percentage of the land in farms which lies on steep slopes and the permanent difficulty attending transportation must be taken into consideration. In view of these facts, cheap and bulky crops, except as absorbed locally, do not fit into the agricultural economy. This is especially true in view of the small size of the farms and the available surplus of labor.

There appear to be several clearly marked opportunities for agriculture in the Mountains: (1) The permanent use of the more level lands in the production of corn, some oats, and forage crops in connection with a stock and dairy industry designed to supply the needs of the mining communities; (2) The enlargement of the truck gardening and fruit industry to furnish vegetables, melons and fruit for nearby communities; (3) The proper care of the farm woodlot as a permanent source of timber and nuts; (4) The enlargement of the poultry industry as a supplementary source of income.

Living is not cheap in the Mountains at present. Much of the food which could be grown locally is shipped in. The high freight rates over the heavy grades of the railroads which penetrate the mountains give the local producer a permanent advantage in nearby markets. In view of this condition, the opportunities for a modification of the agriculture to more fully supply the needs of the mining communities seems to be extremely promising.

The present rather shiftless and extensive system of agriculture will be obliged to give way to some more rational use of the land or the farming community will fail even more conclusively than at present to secure a satisfactory living from the land. It is highly probable that the only method by which the necessary change could be introduced into the agricultural practice would be at state expense. The mountaineer is extremely conservative and does not change readily. If left to take its natural course, the necessary adjustment to present conditions would occur too slowly. It will be more economical, over an extended period, to hasten the change at state expense, rather than to allow it to occur slowly.

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CHAPTER IV

LIVING CONDITIONS IN THE RURAL DISTRICTS AND MINING COMMUNITIES

Rural Districts

Living conditions in both the creek bottom and ridge top settlements are poor. In part, this is due to poor soil and lack of markets for home produce. Some of the existing conditions are, however, the result of shiftlessness and many more represent a survival of pioneer willingness to put up with inconveniences. Many parts of the area are still difficult of access, even in good weather, and during the winter and spring are virtually cut off completely from the outside. Under such conditions, the improvement in living conditions which has taken place in rural communities in most sections of the country has not occurred here, except in small degree.

The older houses are constructed of roughly squared and fitted logs with fireplace and chimney of sandstone slabs, quite often laid with mud in place of mortar. (See Pl. XXIII.) Roofs of these log houses are of hand split shingles or "boards." Some of the houses are single room cabins, as shown in Plate X; others have two rooms with a hall between and a long, low porch across the front as shown in Plate XI. The newer houses at the heads of the smaller coves and those built on the bottoms of the larger creeks since the coming of the sawmills are unpainted and unplastered one or two room frame structures as shown in Plate XII. On the larger bottoms, especially on the western border, the houses are more pretentious and not infrequently are quite substantial, well kept structures, often with the double porch so characteristic of Kentucky architecture. (See Pl. XVII).

In Breathitt County, the average value of all buildings is only $176.50, and in McCreary County, only $234.84 per farm.[1] These are average values in typical mountain counties and far in excess of the value of the miserable structures on many of the farms.

PLATE XXIII. MOUNTAIN HOME SHOWING A TYPICAL CHIMNEY OF SANDSTONE SLABS.
Bell County near Pineville.

Houses in the creek bottom settlements, particularly along the smaller creeks, are set close to the road and crops are grown up to the door of the house as shown in Pls. VIII, X and XVII. Exceptions to this general rule that the farm yard is small occur where the house is located on a slope which has been abandoned after being cropped. In the areas of ridge top settlements, houses are generally set farther from the road (See Pl. V) and there is more ground around the house not planted to crops, though even in these portions of the Mountains, it is seldom that the large, spacious yards, so characteristic of the farms of other portions of the state, are found. This lack of yard results from the necessity for cultivating all the level land.

Outbuildings are seldom anything more than a few sheds or a single, small log barn. (See Pls. V, XVI and XIX.) In some cases, outbuildings are entirely lacking. (See Pls. VIII and X.) There is never anything comparable to the hay, grain and stock barns of the northern farm. Hay is stacked in the field as shown in Pls. XXI and XXII and corn is kept in a small

crib or may even be fed directly from the field so that outbuildings other than a few sheds are unnecessary. Stock runs in the open except for a very limited portion of the year so that it is unnecessary to construct elaborate shelters for them. Even rock houses are sometimes pressed into use as stables as shown in Plate XXV. These rock houses are sometimes even used as homes. In 1917, two families were found living in one of these caves under Union Cliff at Lynch.[2] The use of rock houses for present day human habitation is, however, rare, though excavation has shown that they were commonly so used by prehistoric man.

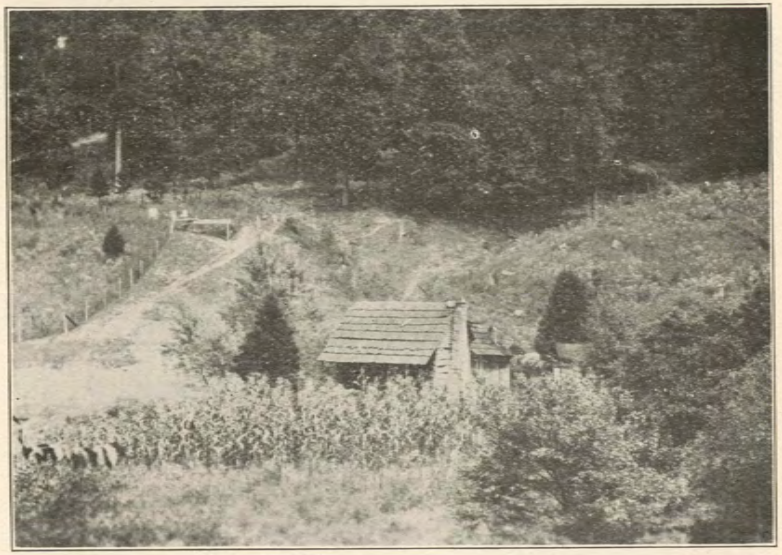


PLATE XXIV. A TYPICAL SMALL FARM AT THE HEAD OF A COVE.
The slopes have been cropped and are now abandoned. The small amount of level land is in corn. In the background is the burying ground.
Messer Branch, Perry County.

Rail fences are in common use in most portions of the area (See Pls. VIII, IX and XVIII), though much of the land is not well fenced. In some places, especially around houses, picket fences constructed of hand split stakes are in use. (See Pls. V, XII and XVII.) As evidence of the change which is occurring in the Mountains, an occasional woven wire fence will be found. (See Pl. XXII.)

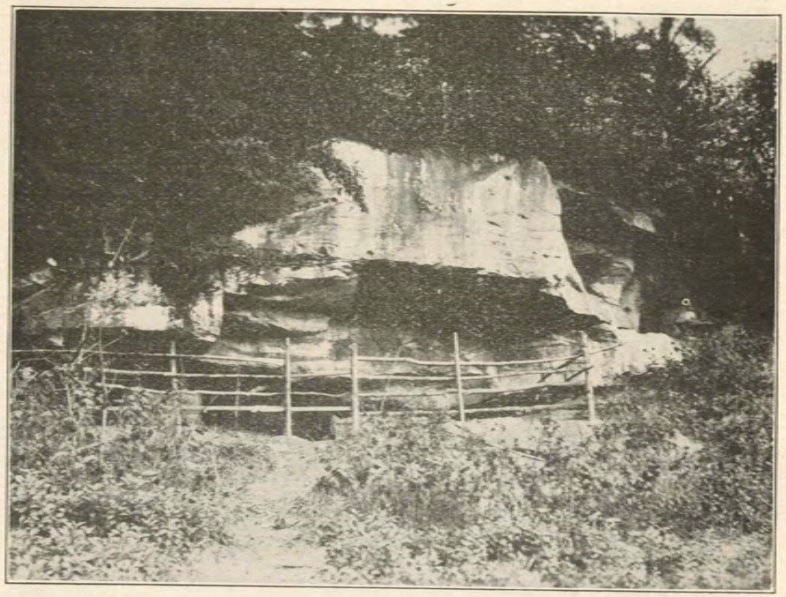


PLATE XXV. ROCK HOUSE IN USE AS A STABLE.
Eastern Lee County near Beattyville.

Domestic conveniences are still few in number in the Mountains, though conditions are improving slowly in that respect. All of the houses of the poorer areas are scantily furnished and much of the furniture is of local manufacture, though this is less true today than it was a few years ago as cheap metal beds and other furniture have displaced to a large extent the cherry bedsteads and split bottomed chairs of hickory. Kitchen utensils were and still are frequently limited to a frying pan, an iron pot, a bucket, a coffee pot and a few tins, supplemented by gourds of various sizes and shapes. In the small one room houses, the preparation of meals is frequently transferred to the yard during the summer when the weather is warm and dry. Though the day has largely passed when the women "battle the clothes in the stream," washing is a laborious process, carried on out doors by the side of a stream in the summer as shown in Plate XXVI. Spinning wheels are still in limited use at the headwaters of the Kentucky River and in the other more isolated portions of the Mountains, but they are used only by the older

PLATE XXVI. WASHING CLOTHES BY THE SIDE OF A BRANCH, PERRY COUNTY.

PHOTOGRAPH BY R. S. ALTER

PLATE XXVII. "AUNT" EMILY VANOVER.
McCreary County near Cumberland Falls.

people and are disappearing rapidly. Mail order goods and locally purchased merchandise have practically replaced homespun in all except the most isolated localities.

Mail reaches all parts of the Mountains and the mail order catalog has supplied the mountain people with a knowledge of the products of the outside world so that factory products of various kinds have largely supplanted articles of home manufacture. The mail is carried in bags slung across the backs of horses or mules as shown in Plate XXVIII. During the summer, when the creeks are low, mail is delivered with regularity, but in the spring, delivery may be interrupted for periods of considerable length.

PLATE XXVIII. BRINGING IN THE MAIL TO STEVENSON.
Meatscaffold Creek, Breathitt County. The mail is carried in the bags slung across the back of the mule at the right.

Up to a few years ago, there was nothing in the way of modern conveniences in the way of light, heat and sanitary plumbing in any farm house. Today, the kerosene lamp has largely displaced the candle, and in most houses, stoves supplement or replace the fireplace. In an occasional house, a hot air furnace has been installed. Sanitary plumbing is, however,

lacking and the drinking water supply is in general inadequate and poor in quality. Wells are generally open and shallow and the water is subject to contamination. In many cases, these shallow wells go dry in the summer, and in practically all cases, the water is warm. Where springs furnish the drinking water, the quality of the water varies greatly, but in general the supply is scanty in the summer time and the quality of the water is open to suspicion.

On the farms, little machinery is used. On account of the steep slopes, modern farm machinery could not be used to advantage, even though the cost were not prohibitive. Scythes, cradles, flails and wooden harrows with locust wood teeth still are in common use. In the preparation of the land, the bull tongue plow is ordinarily used, though sometimes the ground is simply "drug" with the branch of a tree. The hominy block and the hand mill have largely passed out of use and the old water mills are likewise being displaced, giving way to mills operated by small gas engines which grind the corn much more

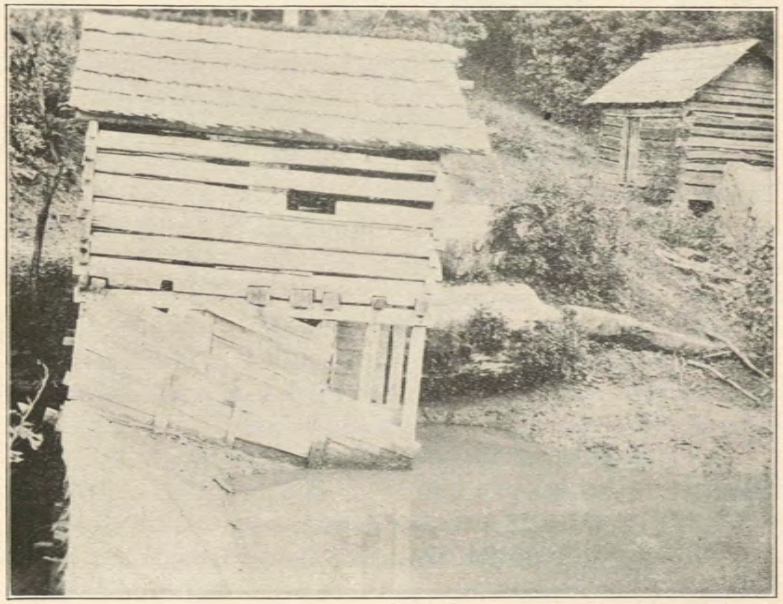


PLATE XXIX. OLD MILL ON EAGLE CREEK, McCREARY COUNTY.
Mill at left, storehouse at right. Mill set well above high water stage in the creek.

rapidly, but according to the inhabitants, produce a meal of poorer quality than that ground between the stones of the water mills.

In the rural sections, sanitary conditions are poor. In 1913, 42.3% of the 4,957 persons examined in Harlan County by the Rockefeller Sanitary Commission were infected with hookworm.[3] Tuberculosis is also alarmingly prevalent. The failure to segregate the feeble-minded and the continuous emigration of the more ambitious tends to lower steadily the quality of the stock and to increase the number and percentage of those of inferior mentality. Living conditions are such that vitality is impaired even though actual disease may not occur. Insanitary housing conditions, poorly cooked and sometimes insufficient food with little variety, and exposure, taken together with intermarriage and the excessive use of liquor, have had a cumulative effect. Many of the older men are of splendid physique, but the younger generation shows evidence of physical deterioration.

Rural schools reflect the stage of development of the area and evidence its retardation. Schools are large, averaging over 50 pupils per school and teacher. Retardation in the grades is very pronounced. In studies made in Harlan County, 56% of the pupils were retarded from one to eight years, employing a very liberal basis for the computation of retardation.[4] The school year rarely exceeds six months in length and it may be less, and to increase this difficulty, the attendance is poor and the instruction only mediocre. Schools are in session only during the summer months, as roads are impassable in the winter and spring. Many of the older school houses are constructed of logs, though the newer ones are of frame construction. Present conditions are a great improvement over those of ten years ago, but by comparision with the schools of more highly developed areas, they leave much to be desired.

No description of living conditions in the Kentucky Mountains would be complete without mention of the settlement schools of which the Pine Mountain Settlement School may serve as a type. At this school, which was founded in 1913, approximately one hundred children live and receive a training which will enable them to meet successfully the problems of life in the Mountains. Both boys and girls are organized in super-

PLATE XXX. PINE MOUNTAIN SETTLEMENT SCHOOL.
The main building and assembly hall.

vised, self governing groups living in separate houses and so are taught to respect law and order. The boys are taught to perform the tasks which will confront them on the farm and the girls are taught to keep house. They are instructed, by example, what personal cleanliness and sanitation mean. Meals are well cooked and well served and are object lessons in home making. The children earn a part of their expenses by helping with the work in the kitchen, laundry and garden and on the farm. In addition to the training mentioned, academic work is carried through the eighth grade and a normal school course is offered for prospective teachers. After leaving school, the students serve to spread by example, in the communities in which they live, improved methods of farm practice and better standards of living. Farther to the north, the W. C. T. U. Settlement School at Hindman is doing valuable work along similar lines. Such schools are doing an invaluable work as they are probably pursuing the only practicable method of producing

the necessary changes in the agricultural and economic development of the rural districts of the Kentucky Mountains.

Mining Communities

The development of the coal resource has resulted in the superimposition of twentieth century industrialism upon a community of self sufficing households. This has been accompanied by profound changes, the amount and character of which have been determined by the type of coal mining operation. At Lynch and Jenkins, modern towns have been created and labor has been brought in from the outside; at Benham, the conditions are similar except that a somewhat larger percentage of local labor is employed; in other sections, small individual companies have created communities quite different from those built by the large corporations. Mining camps are of three classes, the character of the community depending on the size of the development, and to a large extent, upon the amount of crowding which occurs.

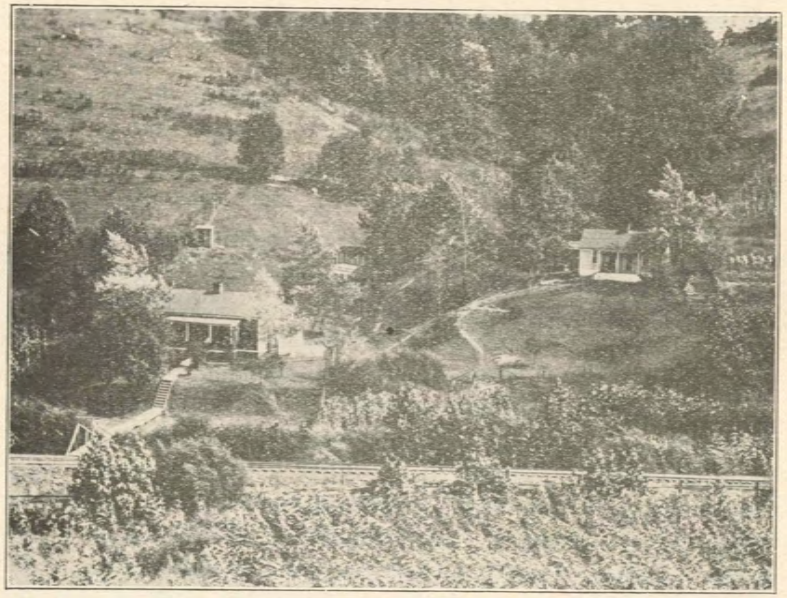


PLATE XXXI. MINERS' HOMES AND FARMS.
Crops in the field. Cannel City, Morgan County.

In the first class, where development has not completely altered the character of the community, the miners are drawn from the immediate vicinity; the majority of the miners own their own homes and have gardens as shown in Plate XXXI. Company houses in large part stand vacant, but those that are occupied usually have a garden. In such communities, there may be no electric lighting, sewer, or water system, but houses are widely enough scattered so that living conditions are not intolerable. In fact, they are in general better than in the rural sections because of the opportunity afforded to supplement the income from work in the mines with the products of the small farms.

Where the small developments are numerous and the mines are close together, the crowding which ensues leads to very unsatisfactory living conditions. The small amount of level land, particularly along the small creeks and branches, makes it difficult to construct streets except at considerable expense, consequently the houses are often scattered over the hillside as shown

PLATE XXXII. MINERS' HOUSES SCATTERED ON THE SLOPES ADJOINING THE CREEK.
Messer Branch, Perry County.

in Plate XXXII. The limited area of level land available along the creeks makes it necessary to set the houses close together which eliminates the gardens and leads to insanitary conditions. Railroad tracks follow the course of the creek and add the noise and smoke of the trains to the clatter of the coal in the tipple. Tin cans, garbage and refuse of all kinds are dumped in the street. There are no sidewalks; after a heavy rain one must pick his way from stone to stone through the pools of filth in the so called streets. Many of the houses are without toilets of any sort; others have filthy vault privies. Streams which flow through these camps are open sewers. On a hot summer day, the stench is almost unendurable. Pigs, cows and chickens roam the streets and both pigs and chickens make themselves at home in the houses as well. A typical street of the character described is shown in Plate XXXIII. The houses in these camps are in

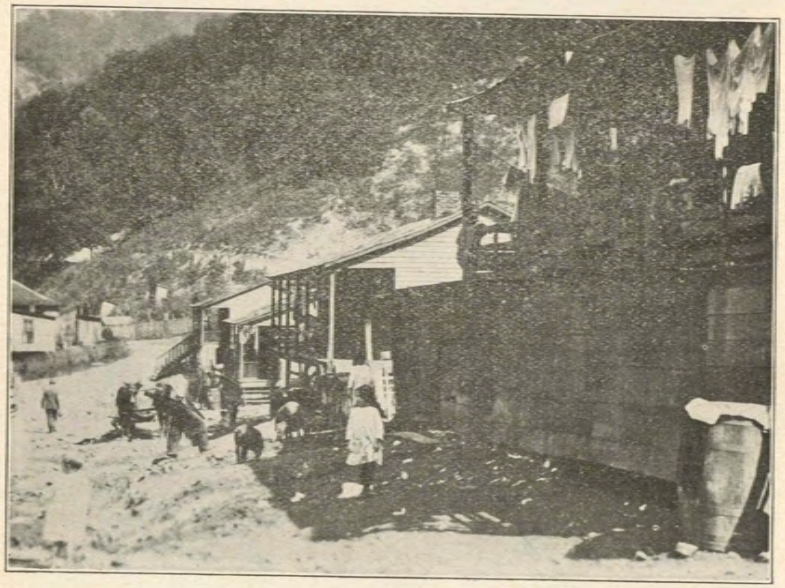


PLATE XXXIII. A TYPICAL STREET IN ONE OF THE SMALLER MINING CAMPS.
The houses are crowded together along the creek. Messer Branch, Perry County.

most cases owned by the coal mining companies. They are generally rectangular, one story, two to four room structures with

small porches across the front. They are usually unplastered and often unpainted. They are generally wired for electric lights and are commonly heated by a fireplace, supplemented by the coal cooking range. Rents are normally about $2.00 per month per room.

Few houses are screened and no sanitary precautions are observed in many of the camps. The flies, which breed in the filth and garbage, constitute an ever present menace of fly borne epidemics during hot weather and the frequently contaminated water supply adds to the danger, as wells are seldom protected from pollution and the same is true for the springs. Water for household use must often be carried for considerable distances, which leads to the use of polluted water from nearby sources for many purposes.

The above picture of living conditions is, for many of the camps, in no way overdrawn, but to remedy these conditions is very difficult. Small, individual mines will hardly incur voluntarily the expense of the necessary improvements and concerted action would probably be difficult if not impossible to secure. In addition, the fault is not entirely with the operators. Even where attempts are made to secure sanitary conditions, passive if not active opposition is often encountered from the miner and his family.

Schools in the mining communities vary greatly, but they are probably above the average for the Mountains and they are in session for a larger fraction of the year. The mines have brought in large numbers of negroes for whom separate schools are maintained. In such schools, the enrollment is large and conditions are usually far from ideal.

In the larger coal mining camps, such as those of the Consolidation Coal Company at Jenkins, the United States Steel Corporation at Lynch, and the International Harvester Company at Benham, conditions are very different from those existing in the smaller camps. In these larger camps, the resources of large capital and trained technical skill have produced model mining towns, with good houses, paved streets, sewage and water

systems, schools, churches, hotels, hospitals and recreation grounds.

In 1917, conditions at Lynch were similar to those pictured in Plate XXXIV. The narrow bottom of Looney Creek, between the two spurs of the Big Black Mountain, was occupied by poor farms, similar in appearance to that in the illustration. Today, there is a large community with lighted and paved streets of

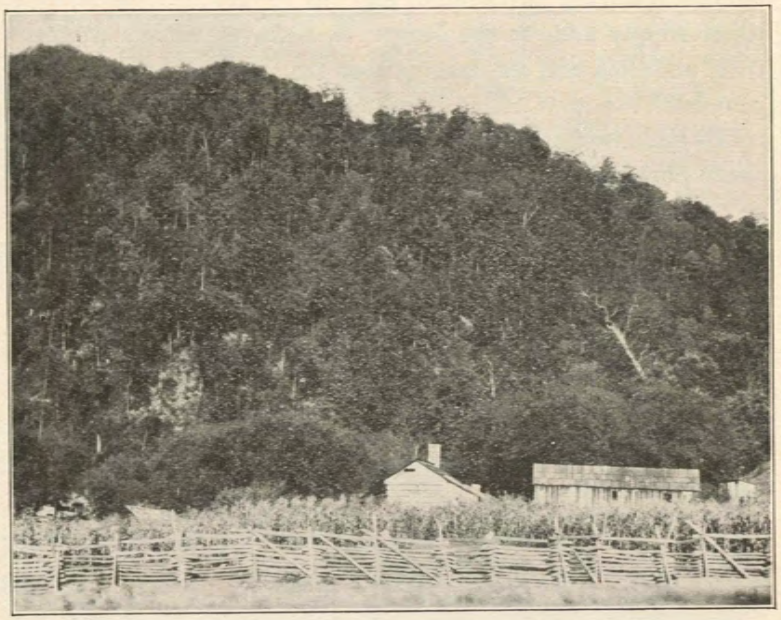


PLATE XXXIV. HOUSE AND CORNFIELD ON THE BOTTOMS OF LOONEY CREEK.

Just above Lynch. Similar conditions existed where Lynch now stands, less than six years ago. Harlan County.

easy grade as shown in Plate XXXV. The hotel, churches, hospital, commissary, postoffice and other buildings of similar character are well built and mostly of brick or stone construction. Houses are attractive, well painted and electrically lighted, connected with a sewer system, and provided with running water and sanitary toilets. Yards are of fair size and the architecture of the houses is sufficiently varied to make the camp attractive.

Green lawns and flowers are common in the yards and add to the appearance of the community. These larger camps are provided with recreation grounds and baseball parks. This is true at Jenkins, Lynch and Benham. Conditions as to housing and buildings are much alike at all these larger camps.

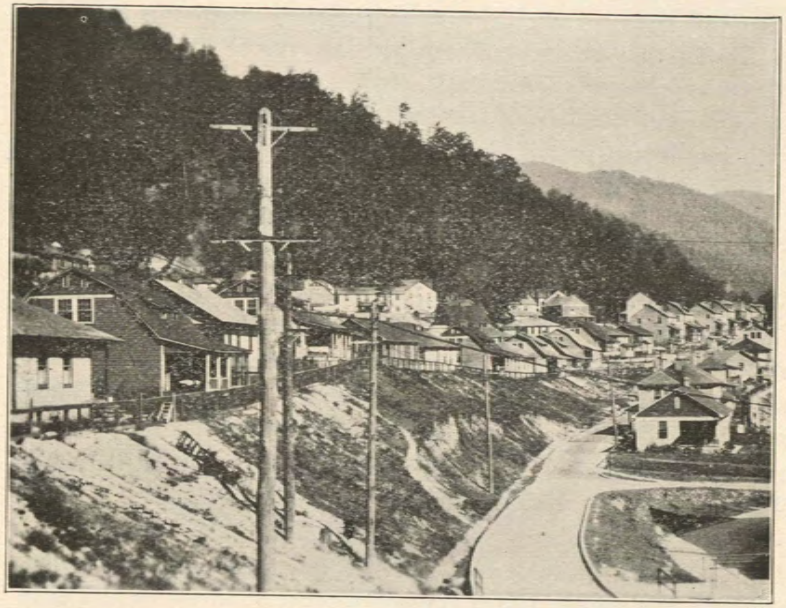


PLATE XXXV. PAVED STREET AND MINERS' HOMES AT LYNCH, HARLAN COUNTY.

Garbage is removed and the attempt is made, more or less successfully, to keep pigs out of the streets. Water is piped into these larger camps from deep wells, large springs or some other satisfactory source of supply. At Stearns, in McCreary County, steam is condensed and used for the drinking water supply.

Schools in these larger camps are good. The school year is of fair length, the instruction appears to be satisfactory, and the buildings are substantial and attractive. At Jenkins, a new school was in the process of construction during the summer of 1922 to increase the facilities afforded by the present building. Teachers in these schools find good accommodations at the company hotels and club houses.

Conditions are at their worst where numerous small mines crowd one another so that sanitary conditions become unsatisfactory. This condition should certainly be remedied, but probably nothing short of state compulsion will be effective in producing the necessary changes. The present ruling of the State Board of Health would, if rigidly enforced, provide a solution, but as the matter stands today, the law is a dead letter except where compliance is voluntary. Where financial considerations make it impracticable to live up to the ruling, it is disregarded with impunity.

Ownership of the Land

In both 1900 and 1910, the percentage of tenancy in the Mountains was slightly greater than for the state as a whole, the gap between the average for the Mountains and the entire state widening between 1900 and 1910. Since 1910, however, the percentage of tenancy has decreased until now it is below the average for the state. This is what would normally be expected in view of the low agricultural desirability of the area. The situation between 1900 and 1910 was abnormal and was the result of the acquisition of large blocks of timber and mineral lands by individuals or corporations. A single large land purchase in one county might convert several hundred former land owners into tenants, without any change whatever in the desirability of the land for agricultural use.

A normal decrease in tenancy may be expected in every county as it is almost impossible to secure rent for a farm from which the owner can hardly extract an existence. Such farms, on being left by the owner, are abandoned but not rented. An increase in tenancy is characteristic of good farming areas, but not of sections such as the Kentucky Mountains.

In individual counties, as will be noted from the accompanying tabulation, tenancy increased between 1910 and 1920, though this was not true for the area as a whole. This was true in Leslie County, for example, and here again the explanation is to be found in the conversion of former landowners into tenants by the acquisition of large holdings by individuals or by corporations.

THE OWNERSHIP OF THE LAND.

Counties	Number of Farms Worked by Tenants			Percentage of all Farms Worked by Tenants 1920	Value of Land, 1920
	1900	1910	1920		
Bell	743	728	807	48.5	20.95
Boyd	271	365	243	29.3	36.66
Breathitt	808	1,240	1,152	40.6	12.56
Carter	950	1,142	690	26.1	17.18
Clay	1,141	1,134	1,212	39.2	15.40
Elliott	457	503	437	28.4	11.88
Estill	502	568	508	27.7	20.80
Floyd	1,063	1,373	1,264	41.7	22.56
Greenup	632	773	495	24.5	21.11
Harlan	692	925	769	53.0	47.82
Jackson	509	511	278	13.5	10.39
Johnson	876	817	505	23.1	19.52
Knott	432	881	521	28.1	18.39
Knox	821	1,120	920	32.0	15.22
Laurel	524	668	460	15.7	15.28
Lawrence	1,000	1,038	565	21.6	14.54
Lee	443	413	268	24.7	12.85
Leslie	276	514	685	40.4	12.28
Letcher	535	636	536	33.5	25.32
McCreary	.....	.....	262	22.6	6.70
Magoffin	548	625	571	25.6	17.01
Martin	403	368	370	34.0	11.79
Menifee	209	290	233	22.1	8.73
Morgan	609	636	535	18.5	14.57
Owsley	414	475	338	25.4	13.90
Perry	454	664	254	19.2	17.14
Pike	1,292	1,764	1,290	28.9	19.31
Powell	259	274	182	21.6	18.30
Pulaski	1,220	1,283	1,074	21.4	22.58
Rockcastle	552	672	617	26.8	15.51
Rowan	275	281	244	18.7	10.10
Wayne	734	818	690	28.2	17.31
Whitley	978	1,171	645	24.7	13.82
Wolfe	513	558	360	27.7	12.76
Totals	21,235 (33.9%)	25,434 (35.3%)	19,980 (28.5%)		
Average for the Mountains				28.5	17.37
State average	(32.8%)	(33.9%)		33.4	48.62

Numbers in parentheses represent the percentage of the total number of farms operated by tenants. (Data from U. S. Census.)

REFERENCES.

1. Census of the United States: Agriculture, Kentucky. Statistics for the State and its Counties, 1920.
2. Ellis, Mabel Brown: Children of the Kentucky Coal Fields. The American Child, Feb., 1920, p. 309. (Published by National Child Labor Committee, New York City.)
3. Ibid, p. 300.
4. Ibid, p. 351.

CHAPTER V

HIGHWAYS AND TRANSPORTATION

Roads

Topographic sheets are available for nearly all the mountain counties. Those of recent publication are excellent maps, showing the present roads, but the older maps based on surveys made several years ago, do not portray accurately existing conditions as to roads and human habitations. Road maps as such are not available and the locally available information concerning the total mileage of the roads in a given county is very meager. According to the best information available, it is estimated that the total mileage of the public roads in the Mountains in 1922 was approximately 13,000 miles, or a trifle over one mile of road for every square mile of area. These figures are based in large part upon the estimates of the Department of Agriculture, Labor and

PLATE XXXVI. A VIEW ON THE "WILDERNESS ROAD."
At present a wide, hard surfaced highway. Near Cumberland Gap, Bell County.

Statistics for 1920-1921,[1] and are probably too high because, in such an attempted estimate, it is difficult to know what constitutes a road, as many of the so-called roads are hardly worthy of the name. In the entire mountain area, there are not to exceed 300 miles of good roads and a somewhat larger mileage of roads that have been improved to some extent; the balance of the roads, or approximately 12,000 miles, are without improvement worthy of the name.

The roads do not form a regular mesh as the topography is such that it is impracticable. In the area of creek bottom settlements, roads follow the creeks as shown in Fig. 5 which also shows the typical close spacing of houses along such roads. Where improved roads cross the ridges, the grade is decreased by a switchback method of ascent, as shown in Plate XXXVII, but on the unimproved roads, the grade is commonly steep and the roads are washed badly. In the area of ridge top settlements, the roads wind along the ridge tops as shown in Fig. 4

PLATE XXXVII. AN IMPROVED ROAD CROSSING THE "MOUNTAINS."
Near Jackson in Breathitt County.

which also shows the spacing of the houses to be wider than in the areas of creek bottom settlements. This is not due so much to difference in the density of population as it is to the greater concentration of the desirable land in the areas of creek bottom settlements. On the western margin, where the ridges narrow and the valleys widen, roads follow both the ridges and the river valleys as shown in Fig. 3.

The improved, hard surfaced roads are of fair width, but most of the roads are narrow, in places hardly wide enough for a single wagon, and in few places wide enough so that two vehicles can pass. This is particularly true in the area of creek bottom settlements wherever the road is on a bench above the creek level as shown in Plate XXXVIII.

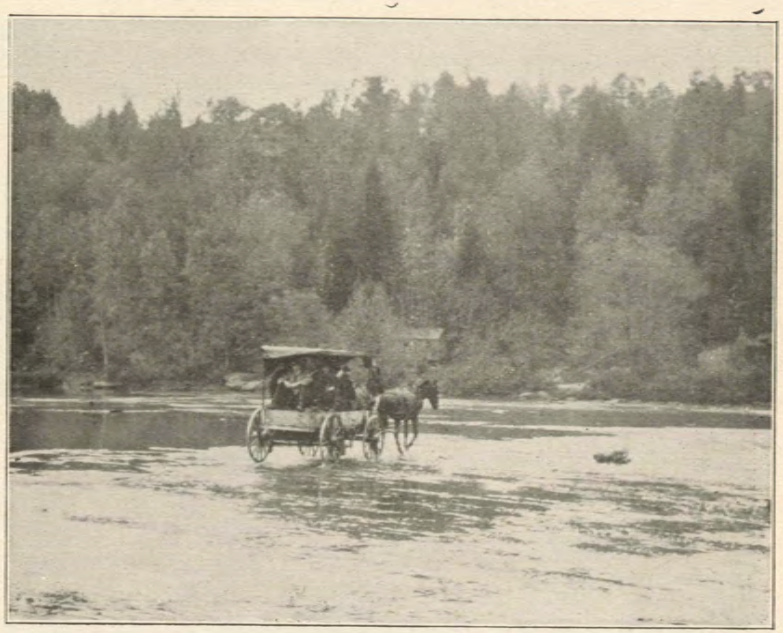
PLATE XXXVIII. ROAD ON A BENCH BLASTED OUT OF THE SLOPE.
The roadbed is coal and the heaps of material in the foreground are coal. Quicksand Creek, Breathitt County.

In the area of creek bottom settlements, the principal roads are located on the slopes bordering the streams, well above normal high water stages of the rivers, but the roads up the smaller valleys are in the creek bed. This is made necessary by the small

amount of level land, which is fully in use in the production of crops, and the expense involved in locating the road on the slopes. Plate IX shows such a road during the summer low water stage in the creek. At such times, though somewhat rough, the roads are usable, but high water during the winter and spring interrupts communication for weeks at a time. Bridges for vehicular use are few in number in all parts of the Mountains, the great fluctuations in stream volume making the cost of construction prohibitive. Though wagon bridges are not common, footbridges of the suspension type are frequently constructed.

In the area of ridge top settlements, the winding roads follow the ridges, crossing valleys only where necessary. Wherever such a crossing occurs, it is generally necessary to ford the river, as bridges are few in number. At low water stages, even the larger rivers such as the Cumberland can be forded, but when the creeks and rivers are "up," it is always difficult and often impossible, so that in this area as elsewhere, roads are closed to travel for considerable periods.

PLATE XXXIX. A RIDGE TOP ROAD IN WHITLEY COUNTY.
Near Cumberland Falls.



PHOTOGRAPH BY R. S. ALTER

PLATE XL. FORDING THE CUMBERLAND RIVER.
Above Cumberland Falls at low water stage of the river.

Most of the roads in all parts of the Mountains are impassable with a load except during the summer and early fall months and, even at those seasons, transportation by wagon is expensive. It is not an uncommon sight to see two teams hauling a small wagon. On many roads, wagons cannot be used and sleds are substituted. Under the existing conditions as to roads, travel is largely on horseback and a great many of the products of the area are transported packed on the backs of mules and horses. In the spring and after heavy rains, the poorly drained and often heavy clayey roads become bottomless morasses over which transportation is almost impossible.

It will never be feasible to improve all the roads. Roads up the smaller valleys will remain in the creek beds and will be poor roads permanently, as the expense involved will prevent their improvement. The main roads, however, should be improved and the future is almost certain to witness the building of a large mileage of good roads. There is at present one

PHOTOGRAPH BY J. F. SMITH, BEREA COLLEGE

PLATE XLI. A MOUNTAIN ROAD IN THE SPRING.

good road entirely across the Mountains through Cumberland Gap, and with a few breaks, a passable road across the northern portion, through Pound Gap. The next few years will doubtless witness the completion of the road to Jackson and Hazard and possibly beyond. The projected Primary System of State and National Highways will, when completed, furnish a framework to which can be attached local roads. These primary highways should be constructed and the cost assessed largely against the destructive forms of exploitation, so that with the disappearance of the exhaustible resources, the area may be left with an adequate equipment of improvements.

Good roads would remove the isolation of the area and permit the marketing of the products of the farms to better advantage. In addition, they would make the area more accessible from the outside. The Mountains of Eastern Kentucky are within easy touring radius of urban centers with a total population of several million people. Cleveland, Toledo, De-

FIG. 14. PROJECTED PRIMARY HIGHWAY SYSTEM.

troit, Chicago, Cincinnati, and many smaller places are within easy reach of the area and thousands from these cities would visit the Mountains every year if good roads were available. The advertising which the area has received in the field of fiction gives it an interest possessed by few other sections of the United States, and by none so easily reached from the above mentioned cities. In addition, the area is scenically very attractive. The numerous illustrations throughout the text evidence the scenic beauty. The tree clad slopes of Pine Mountain furnish many beautiful views; Cumberland Falls (See Pl. III); the rock filled gorge below the falls, and Natural Bridge (See Pl. II) are among the better known scenic attractions of the area, but it is

unfair to single out places for there is hardly a square mile that is not beautiful, except where man has robbed the hills of their forest cover or otherwise marred the face of nature. Many portions of the Mountains possess great historic interest, for it was through this region that one of the great migrations to the west occurred. It is an area that should be made accessible at an early date.

River Navigation

At an early date, the lack of good roads and the absence of railroads compelled use of the rivers as highways, consequently a considerable volume of trade was carried by the rivers in spite of the obstacles to navigation. The principal of the natural obstacles were the "roughs and narrows" or the reefs of more resistant rock in the narrow and rocky gorges and the falls and rapids which occur in some of the streams. In addition, snags and shifting bars of sand and gravel added to the difficulty of

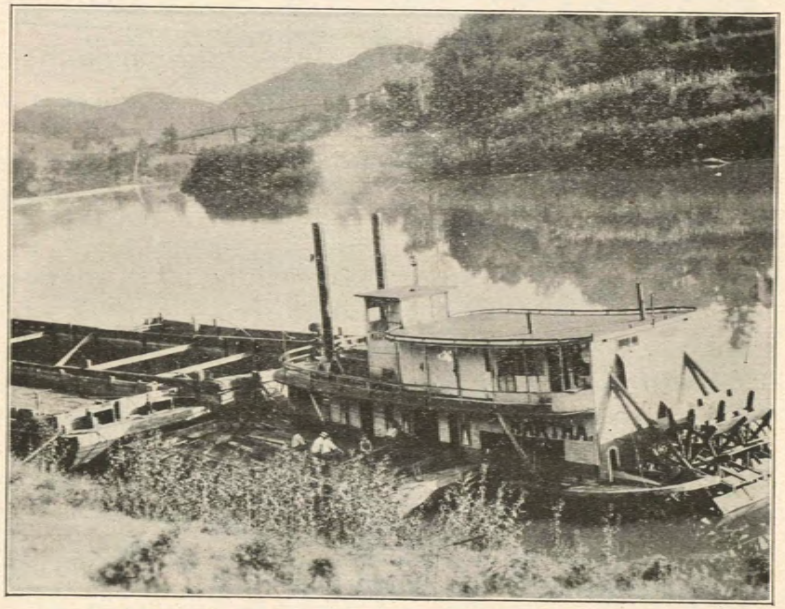


PLATE XLII. BARGES AND TYPICAL STERN WHEEL FREIGHT AND TOW BOAT.
Tied up to the shore. Kentucky River below Beattyville, Lee County.

navigation. With increasing settlement, artificial obstructions such as mill dams and timber booms still further decreased the value of the rivers as highways.

In spite of these obstacles, the rivers were the principal arteries of trade during the early period. Steamboats carried the commerce to the head of navigation on the different rivers and push-boats, or flatboats equipped with oars, proceeded farther up stream.[2] The early importance of the rivers led to numerous efforts to overcome the difficulties attendant on their use by the improvement of the channels and the construction of slack water systems which would render navigation possible during a larger fraction of the year. Without such improvements, the rivers could be used for a relatively small portion of the year as fluctuations in stream volume caused variations in depth of from a few inches or feet to flood stages of from 20 to 40 feet or more.

At the present time, the rivers of eastern Kentucky are of minor and declining importance for navigation, both actually

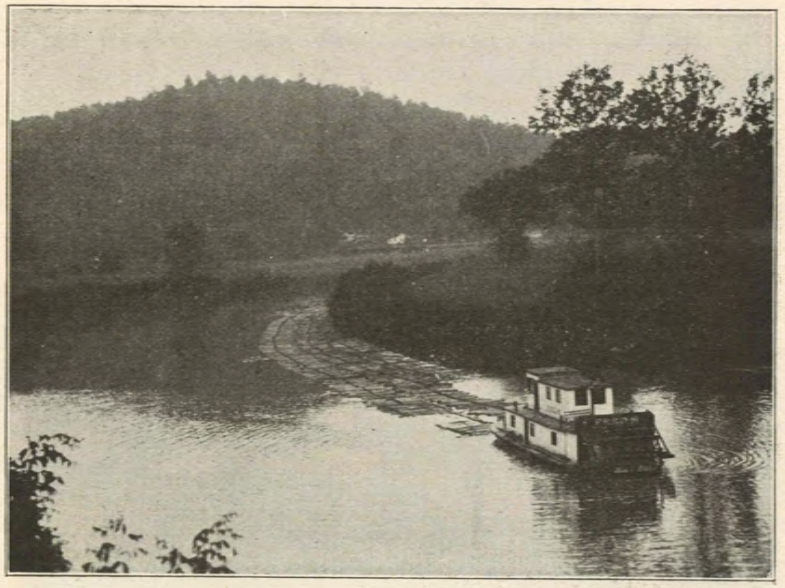


PLATE XLIII. TOWING A RAFT OF LOGS DOWNSTREAM.
The tow boat is backing down stream and pulling the raft, making diagonally across the stream in order to round the bend. Kentucky River below Beattyville, Lee County.

and relatively. On these streams, the only commodities making use of the open river today in the Mountains proper are forest products. These are floated down the rivers for short distances to the mills, which are near or within the Mountains.

The Kentucky River has been improved by a series of dams which create slack water to the Three Forks, a short distance above Beattyville. Dam No. 14, at Heidelberg in Lee county, is the farthest up stream of the series. In spite of the improvement, the stream shows but small traffic. In part, this may be due to the lowering of railroad rates, but it is more largely the result of difficulties inherent in water transportation. The fact that slack water does not enter the coal producing area to any considerable degree prevents the extended use of water for coal shipments. Every year, transportation on the river is blocked by freshets, ice or drought, whereas the railroads render uninterrupted service. The principal freight carried consists of coal, lumber and rafts of logs. The lumber and coal are carried in barges; the rafts are towed. The coal originates from the

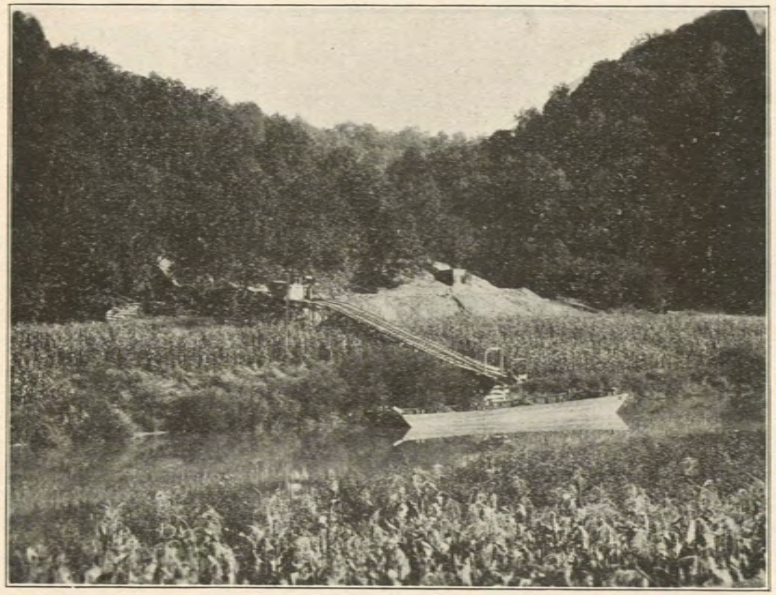


PLATE XLIV. COAL MINE AND BARGE LOADING WITH COAL.
Kentucky River above Beattyville, Lee County.

small mines adjacent to the slack water section of the river. The coal from the major coal mining areas is all carried by rail.

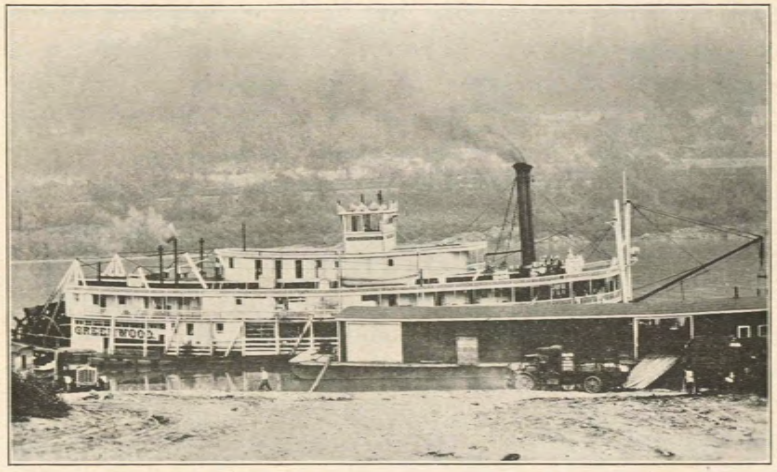


PLATE XLV. OHIO RIVER PACKET TIED UP AT THE FLOATING DOCK AT ASHLAND.
Note the small size of the dock required to handle the river traffic.

On the Ohio River, commerce is likewise limited to traffic in coal and lumber, with the exception of a small amount of local traffic over comparatively short routes. At Ashland, the principal Ohio river port for the Mountains, the small size of the dock required to handle the trade indicates the relative unimportance of this local traffic.

Railroads

Railroads were not significant in the early settlement and development of the Mountains of Eastern Kentucky, but they are today an important factor in determining the activities of the area. The Mountains were occupied and their economic system established with rivers and roads as the means of communication. The building of railroads has resulted in an appreciable rural readjustment in all sections, and in some localities, has been followed by the establishment of twentieth century industrialism in areas which were, prior to railroad construction, greatly retarded and rural in character.

This marked alteration in previously existing conditions has been limited to a narrow belt paralleling the railroads, where the agricultural communities have given way in large part to mining camps. The location of such agglomerations and the dependence of their location upon rail transportation is shown in Fig. 15. In areas only a short distance removed from the railroads, as well as in the remoter counties without any railroads, the modification is less marked. Roads are so poor that a farm located a few miles from a railroad is almost as effectively cut off from markets as though it were removed several times as far. Agricultural practice has, therefore, been affected very little if any in most portions of the area. The coming of the railroads has, however, brought saw mills and some knowledge of the outside world to all parts of the Mountains and to the previously isolated mountaineers. Although the benefit many have derived from the changed conditions accompanying the coming of the railroads may be debatable, the alteration of conditions which has occurred is an actuality to be taken into account. Crop practice may remain essentially unchanged, but the opportunity of the area is different and conditions of life have already altered somewhat and will change more with the modification of the environment which has occurred.

Railroad construction did not begin until 1856,[3] when the first nine miles of the Ashland Coal and Iron Railway were opened. Up to 1885, there were virtually no railroads in the area. The total number of miles did not exceed 250 up to that date, and of that mileage, very little should be credited to the Mountains proper. Practically all of the roads built into the Mountains have been constructed since 1885, this being one of the relatively few areas in the eastern United States in which there has been considerable railroad building at a comparatively recent date. The construction was also unique in that it was in an area with an average density of purely rural population of over 30 to the square mile, an unusually high population density for an area with practically no railroads.

[3] All statements as to dates of construction and names and ownership of railroad lines are on the authority of Poor's Manual of Railroads for 1922 and prior years.

FIG. 15. RAILROAD LINES AND THEIR RELATION TO COAL MINES.

The early railroad lines embraced the Ashland Coal and Iron Railway (1856), the Chattaroi Railway (1881), the Cincinnati, New Orleans and Texas Pacific Railway (1877), the Eastern Kentucky Railroad (1870), the Elizabethtown, Lexington and Big Sandy Railroad (1881), the Kentucky and South Atlantic Railroad (1876), and the Louisville and Nashville Railroad (1859).

Of these lines, the Ashland Coal and Iron Railway from Ashland, Kentucky, to Straight Creek Junction; the Chattaroi Railway from Ashland, Kentucky, to Richardson, Kentucky; the Eastern Kentucky Railroad from Riverton, Kentucky, to Willard, Kentucky; and the Elizabethtown, Lexington and Big

Sandy Railroad from Huntington, West Virginia, to Lexington, Kentucky, where in the northern counties of Greenup, Boyd, Carter, Lawrence and Rowan. These roads were, with the exception of the Elizabethtown, Lexington and Big Sandy Railroad, purely coal mine roads and one of the objects for opening the Elizabethtown, Lexington and Big Sandy Railroad was also to tap the coal fields. These roads were the forerunners and constitute portions of the present group of railroads in the coal mining area of the Big Sandy drainage. The first three were short roads with a total length of 76 miles, entirely within the Mountains and constructed up river valleys with fairly good grades. The Elizabethtown, Lexington and Big Sandy Railroad, the present Cincinnati-Ashland branch of the Chesapeake and Ohio Railroad, entered the plateau by the Licking River breach and then crossed to the Big Sandy drainage.

The short line from Mount Sterling eastward to Rothwell, Kentucky, the Kentucky and South Atlantic Railroad, hardly penetrated the Mountains. The Cincinnati, New Orleans and Texas Pacific Railway, a portion of the present Southern Railway system, entered the plateau by the South Fork of the Cumberland River and utilized the relatively undissected conglomerate portion of the plateau as the best method of approach to Chattanooga. The road was built through this portion of the Mountains because it afforded the most feasible route to Chattanooga; it was not constructed with a view to serving the mountain area or to exploit the resources of the mountain counties which it traversed. In similar fashion, the Lebanon-Knoxville branch of the Louisville and Nashville Railroad from Louisville, Kentucky to Jellico, Tennessee, (the present day Cincinnati-Knoxville branch) entered the plateau through a river breach, that of the Rockcastle, and, after traversing the wide plateau ridges, pierced Pine Mountain at the "Narrows," thus securing an advantageous approach to Knoxville, Tennessee. As in the case of the preceding road, construction through the Mountains was a necessity but not an object of construction. The services which the original road rendered the mountain counties was purely incidental.

All railroads into the Mountains, including both the early lines and those constructed at a later date, encountered great

topographic difficulties. All took advantage of river cut breaches in the western escarpment and all were forced to tunnel through many ridges. All the present roads, except the branch of the Louisville and Nashville up the Kentucky River, approach the plateau region by heavy grades. Miller, in his Geology of Kentucky, aptly refers to the steep westward facing escarpment as a "Chinese Wall" preventing free intercourse between the Bluegrass and the Mountains. Even after entering the plateau, where the railroads follow the rivers, tunnels through ridges and spurs are common, and when construction is on the wide ridges of the southern counties, valleys must be crossed on great fills and high trestles. In view of these difficulties and the expense involved in construction, few roads were built into the area until the increasing demand for coal and timber rendered it profitable to construct railroads to exploit these resources.

The second, or later period of construction, from about 1890 down to the present, witnessed the building of many miles of track in the Mountains. The present mileage in the 34 mountain counties is 1,275, or 50% of the total mileage in state in 1885 and 30% of the present total state mileage.[4] This later construction has in part consisted of the linking up by new construction of previously existing lines, but in larger part, it has consisted of extensions of branch lines up the valleys of the principal rivers and creeks. As will be seen from Fig. 16, which shows the construction by ten years periods from 1885 to 1905, and Fig. 15, which represents the present lines, the major roads are in three groups which correspond to the principal drainage systems: (1) The two branches of the Chesapeake and Ohio which utilize the Ohio and Licking river breaches as approaches to the plateau, (2) The two branches of the Louisville and Nashville which enter the plateau by the Red and Kentucky river valleys, (3) The Louisville and Nashville and the Queen and Crescent (C. N. O. and T. P.), which approach by way of the Cumberland River and its tributaries. From these main lines, branch lines pass up the smaller creeks and tap the coal fields as shown in Fig. 15, which indicates the location of the coal mines of eastern Kentucky.

RAILROADS IN EASTERN KENTUCKY BY COUNTIES.

County	Miles of Track in County	Names of Railroads in County
Bell	163.60	L. & N., Cumberland R. R.
Boyd	41.00	C. & O., Ashland Coal and Iron R. R.
Breathitt	35.91	L. & N., O. & K.
Carter	58.80	C. & O., E. K., A. C. & I., and K. & F.
Clay	14.00	Cumberland & Manchester.
Elliott	.00	
Estill	30.00	L. & N.
Floyd	90.50	C. & O., B. & O., Long Fork R. R.
Greenup	45.00	C. & O., East Ky. R. R.
Harlan	88.00	L. & N.
Jackson	11.00	Rockcastle River Ry. Co.
Johnson	30.00	C. & O., Big Sandy & Ky. River, Miller's Creek Ry.
Knott	.00	
Knox	50.00	L. & N., Cumberland Ry.
Laurel	33.00	L. & N.
Lawrence	40.00	C. & O., East Ky. Ry.
Lee	49.00	L. & N., Lou. & Atlantic.
Leslie	.00	
Letcher	45.00	L. & N., Sandy River & Elkhorn.
McCreary	40.50	C. N. O. and T. P., Ky. & Tenn.
Magoffin	.00	
Martin	.00	
Menifee	10.00	K. S. and A.
Morgan	27.00	Caney Valley, O. & K., Morehead & North Fork R. R.
Owsley	.00	
Perry	49.00	L. & N.
Pike	107.00	L. & N., C. & O.
Powell	27.00	L. & N.
Pulaski	30.00	Southern Ry.
Rockcastle	39.00	L. & N.
Rowan	31.00	C. & O., Morehead and N. Fork Ry.
Wayne	5.50	C. N. O. & T. P., C. B. & C. Ry.
Whitley	63.00	L. & N.
Wolfe	19.00	L. & N., O. K., Mt. Central.
Total	1,275.81	

(Data from Year Book, Dept. of Agr., Labor and Statistics, 1920-21.)

At the present time, the total mileage of 1,275 miles represents one mile of railroad for every 9.5 square miles of area, which is approximately the state average, though only 50% of the state average for Illinois, which possesses a very large railroad mileage. The mileage is largely concentrated in certain areas. Further, linear distance to a railroad line in the Kentucky Mountains does not always accurately express the effective distance as intervening ridges may cut off completely from a

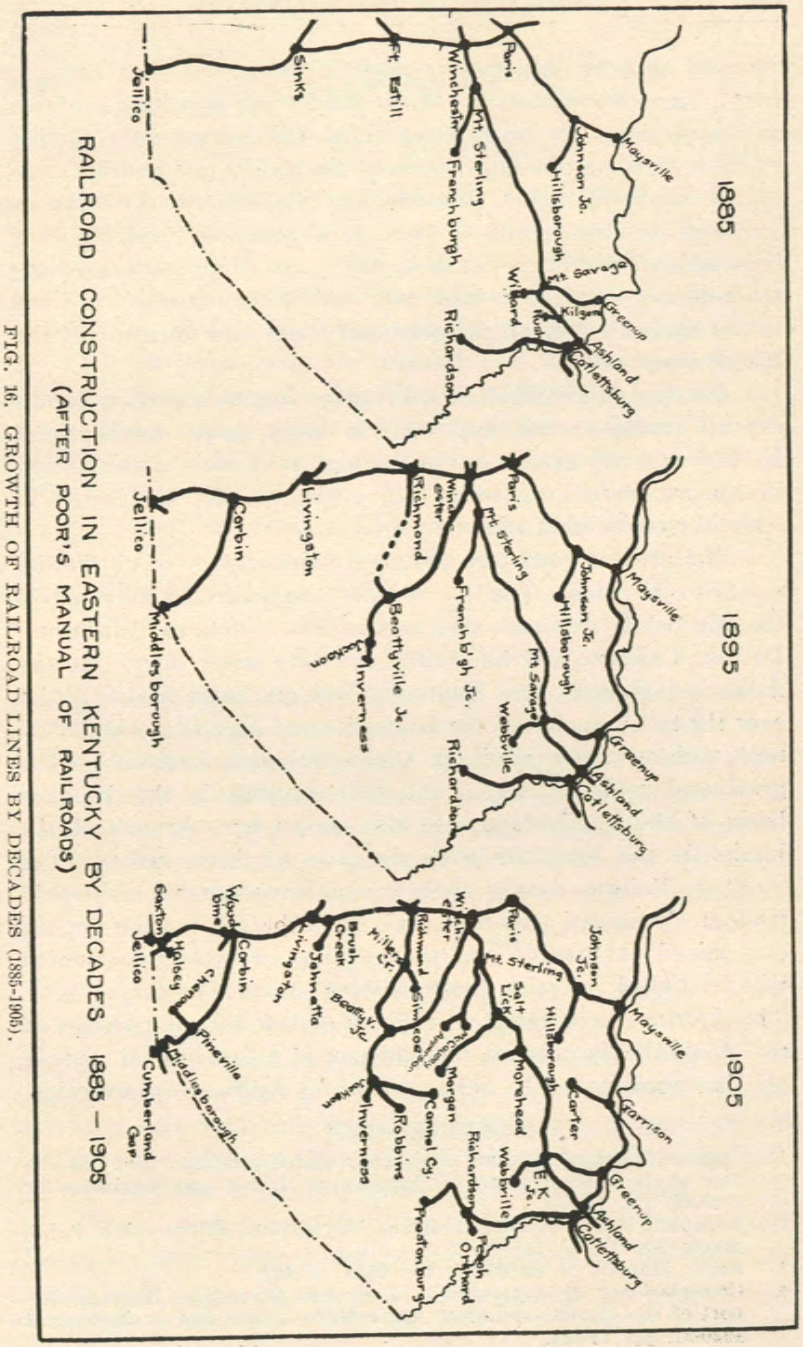


FIG. 16. GROWTH OF RAILROAD LINES BY DECADES (1885-1905).

railroad an area only two or three miles distant in a straight line. There are still six out of the thirty-four mountain counties in which there are no railroad lines, the largest area of this character lying at the headwaters of the Middle and South Forks of the Kentucky River. Inasmuch as the coal resource has as yet been developed only in part, it is practically certain that railroad construction is not at an end in the Mountains and that the next two or three decades will witness the extension of lines to the headwaters of all the principal rivers and up many of the larger creek valleys.

Topographic difficulties will always impose a certain handicap on transportation and will, in many cases, compel long hauls over heavy grades, but as the high rank coals of the United States are limited, railroads will eventually be constructed to serve the entire area adequately.

The present roads are designed primarily to serve the developed coal fields. The line of the Chesapeake and Ohio serves the Big Sandy drainage area and affords outlets to Toledo and Detroit, Chicago, and Louisville, and to a lesser degree, to the Atlantic seaboard. The Kentucky drainage basin has its outlet over the two branches of the Louisville and Nashville which connect with northern roads at Cincinnati and Louisville. The great coal fields of Harlan and Bell counties, in the drainage basin of the Cumberland, are also served by a branch of the Louisville and Nashville, with the same northern outlets. The Southern Railway System, with terminals to the north and northwest at Cincinnati and St. Louis, furnishes the outlet for the coal mined at Stearns and the vicinity. Future construction will be linked up with these existing systems in larger part. The skeleton for a complete railway system for all portions of the Mountains is present; the addition of a few branch lines is all that remains to be accomplished in railroad construction.

REFERENCES.

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2. Verhoeff, Mary: Kentucky River Navigation, Filson Club Publication No. 28, p. 111, 1917.
3. Poor: Manual of Railroads for 1885, p. 492.
4. Commissioner of Agriculture, Labor and Statistics: Biennial Report of the Commissioner of Agriculture, Labor and Statistics for 1920-21, pp. 15-134.

CHAPTER VI

MINERAL WEALTH AND THE MINERAL INDUSTRIES

The mineral wealth of the Mountains of Eastern Kentucky constitutes the major economic asset of the area. Although it has been known for many years that enormous resources of coal and other valuable minerals existed in the region, it has been only within the past two decades, and even more largely within the past ten years, that any considerable development of the resources has occurred. Topographic difficulties and the absence of rail transportation prior to that time allowed only the exploitation of the more easily accessible deposits, and even of those, in only a minor way. Of the mineral resources, coal is today the most important and will continue to be of increasingly greater relative importance with the opening up of the country by additional transportation lines.

Coal and Coal Mining

All the counties in the Mountains are underlain by coal,* but both the number and thickness of the seams as well as the quality of the coal, vary greatly. Coal seams are few in number and thin in the western tier of counties, but in counties to the east, as Breathitt, Pike and Letcher, the seams increase in number and may reach an aggregate thickness of over forty feet. In general, the number and thickness of the seams increases to the southeast and the coal improves in quality with the increase in number and thickness of the seams.

The coals of Eastern Kentucky embrace several varieties and are in general of high quality. Cannel coal is found in limited areas throughout the field; coking coals occur in the Elkhorn region; high grade steaming coals are widely distributed, though occurring more frequently and in larger quantity in the southeastern counties. The better coals show a large percentage of fixed carbon and possess high thermal values.

The value of the coal seams is still further increased by their favorable disposition, except in limited areas on the flanks of

*For a complete bibliography of coal by counties, see Miller, Arthur McQueston, Geology of Kentucky: Ky. Geol. Surv., Series 5, Bull. No. 2, pp. 261-281, 1919.

Pine and Cumberland mountains where the tilting of the strata has added to the difficulty of mining the coal. The streams have cut so deeply that a large proportion of the coal is above drainage which obviates the necessity for pumping, thereby decreasing mining costs. As the coal seams are nearly horizontal, drift mining is possible, while slight local dips facilitate drainage and the hauling of the coal, thus eliminating much expense in the mining operations. Ventilation of the mines is also simple. The location of the mines on the slopes with the railroad lines paralleling the creeks is such that gravity again aids in the transfer of the coal to the cars.

Coal was noted in the Kentucky basin by Christopher Gist as early as 1750.[1] From the time of earliest settlement, coal has been used locally to some extent as a fuel, but wood has been so abundant and industrial development so slight, that until quite recently, there has been little incentive to mine coal to supply local demand.

Shipment of coal by river, however, began at a very early date, probably by 1800. For many years, the rivers afforded practically the only means of transporting coal. By 1835, the river trade was well established, and by 1880, 27,473 tons of coal were handled on the Kentucky River.[2] As long as the river was the sole means of transportation, coal mining never assumed large proportions. Further, as long as shipments were made only by river, the location of the mines was determined by stream navagibility rather than by the quantity and quality of the coal.

Early mining operations were extremely crude in character. The early mines were at first operated by farmers as a means of affording slack season employment and a supplementary form of income. At a somewhat later period, small companies were formed and the mining operations were more extensive. Mining methods, however, differed little from those applied in the "farmer diggings" of today. In the drifts, there was no timbering and only natural drainage and ventilation. Tunnels were short, seldom exceeding 60-80 feet in length and none was over 100 feet. As soon as a few boat loads of coal were taken out and the roof began to show signs of weakness, the shaft was abandoned and another one opened.

Coal was generally shipped in flatboats propelled by oars, though rafts were sometimes employed. Though the risk of loss from obstructions in the rivers was great, the farmers frequently netted a considerable profit, the sale of coal furnishing much of the money in circulation in the Mountains at an early date. By 1875, the competition of Pennsylvania coal made itself felt seriously in the markets reached by the coals of eastern Kentucky. Not until railroads were constructed into the Mountains could eastern Kentucky coal meet this competition successfully. Consolidation of holdings, the inflow of capital, modern methods of mining and large scale production rapidly followed railroad construction.

The earliest coal mining following railroad construction occurred in the northeastern counties which were the areas of earliest railroad building. The construction of transportation lines in the other drainage basins led to a similar exploitation of the coal resource and a great increase in the tonnage mined. The intimate relation of railroad and coal mine is shown in Fig. 15. Taken in connection with Fig. 16, which shows the development of the railroad mesh, the interrelationship of coal mining and the transportation system is very evident.

The rapid expansion of production in the Eastern Coal Field is shown in the accompanying tabulation which shows comparative tonnage production by counties and the total production for 1910, 1916, and 1920. The figures are taken from the annual report of the State Inspector of Mines, except as noted in the tabulation. The extraordinary increase from 6,291,259 tons in 1910 to 26,750,000 tons in 1920 and the relatively slow increase prior to 1910 resulted from the fact that only within the last decade have the railroad lines tapped the areas of most promise, and even yet, large sections which contain some of the best coal and the most numerous and thickest seams are not reached by rail and consequently cannot be developed.

The mines vary greatly in character. When opened by individual farmers to supply the needs of a few farms in the immediate vicinity, the entries are but a few feet in length and no provision is made for drainage or ventilation. The roof is seldom supported, and when it shows signs of collapse, the mine is abandoned and a fresh opening is made. Such mining is very

COAL PRODUCTION OF THE EASTERN COAL FIELD.

County	1920		Production in Tons in 1916 of Co-operating Mines (A. M. Miller)
	No. of Mines	Production in Tons of Cooperating Mines	
Bell	96	2,044,242	2,237,340
Boyd	8	128,105	72,439
Breathitt	23	242,788	12,825
Carter	15	206,513	130,436
Clay	12	28,221	
Floyd	68	1,669,033	814,610
Harlan	85	4,597,433	2,204,553
Jackson			9,397
Johnson	17	772,286	1,061,481
Knox	46	573,599	771,685
Laurel	26	6,444	77,321
Lawrence	5	35,251	10,612
Lee	12	66,736	6,623
Letcher	51	3,315,644	3,807,397
McCreary	13	780,404	
Martin	6	30,295	
Morgan	12	180,696	47,727
Perry	56	2,966,426	995,091
Pike	89	4,740,453	3,675,607
Rowan	1	2,760	
Whitley	24	575,834	947,783
Totals	665	22,984,163	16,882,927

Total 1910 production from all mines = 6,291,259 tons.
Total 1916 production from all mines = 25,292,767 tons.
Total 1920 production from all mines = 26,750,000 tons.
(The above totals are estimates.)

wasteful. A typical opening of this kind is shown in Plate XLVI. At the other extreme, are such mines as those operated by the United States Steel Company at Lynch in which the entrance is concreted and the coal is hauled out of the mine over an electrified roadway. Such large scale and efficient operation conserves the resource as well as decreases the cost of mining. In the majority of the mines which are commercial producers of coal, tracks are laid and the coal is hauled to the chute or tipple by mules. The coal, when mined, may be either loaded directly into cars, after being hauled a short distance, or it may be loaded from a tipple which holds a reserve supply. In all

PLATE XLVI. A TYPICAL "FARMER DIGGING."
Perry County near Hazard.

cases, the coal moves by gravity from the entry to the car, as the mines are located above the track level. Typical conditions are shown in Plate XLVII, which represents an average tipple. At Lynch, the tipple, shown in Plate XLVIII, erected at a cost of over a million dollars, has a capacity of 10,000 tons of coal a day. Great variation in the character of the mining communities accompanies the great differences in the character and extent of the mining operations. These differences have been discussed previously in a different connection. (See pp. 94, 100.)

Coal mining has shown continuous growth for a period of several years, both in the number of mines and the tonnage produced. This expansion may be expected to continue. Consumption of coal in the United States increases from decade to decade and the available and accessible reserves of high grade coal such as those of eastern Kentucky will be drawn on to supply the increasing demand. Although the United States possesses an enormous tonnage of coal, a relatively small portion of this reserve is of high rank. The fact that eastern Kentucky

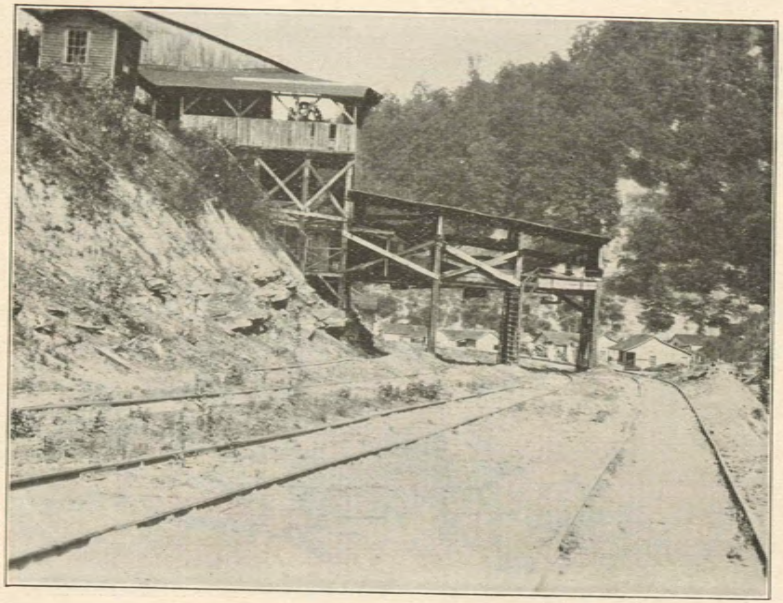

PLATE XLVII. A TYPICAL TIPPLE.
Cars run in one the tracks under the tipple and are loaded by gravity. Perry County.

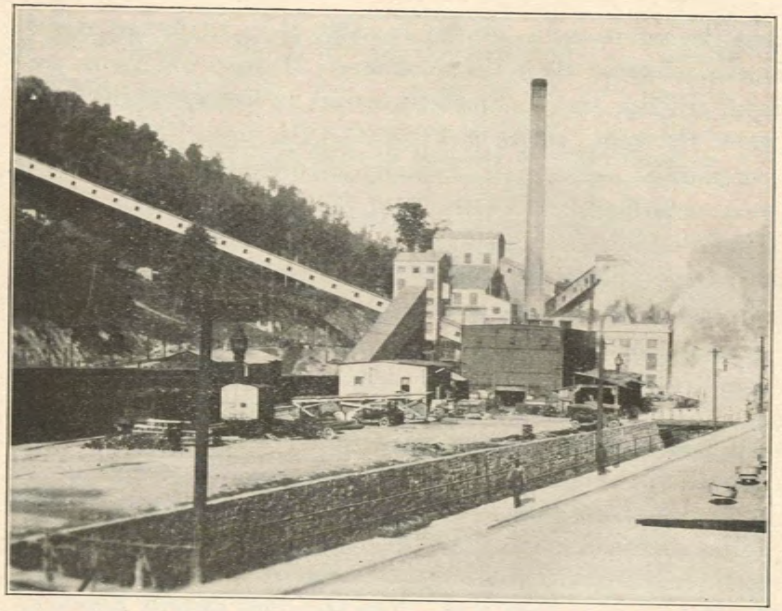

PLATE XLVIII. THE MILLION DOLLAR TIPPLE AT LYNCH.

has such a large supply of high rank coal is a very important fact to consider in any forecast of the future of the mountain area. Each year witnesses the opening up of new areas for mining and the opening of new mines. The recent acquisition by the Ford interests of a large acreage at the headwaters of the Kentucky River is doubtless the forerunner of another large addition to the area of coal production. The rapid opening up of the resource has raised a number of problems which should be considered carefully in the immediate future.

It will be well to remember that coal is an exhaustible resource, and that when mined, there is no way of replacing it. Even though the supply may seem almost without limit at the present time, experience in the past has taught that wasteful use will dissipate a seemingly inexhaustible resource in a relatively short time. It would be well, therefore, to conserve the life of the supply as long as practicable by adopting methods of mining which do not leave the larger part of the coal in the ground in such condition that it can never be recovered. Although it may be impracticable to prevent entirely the small scale, wasteful methods of mining, restrictions should be imposed to check the enormous waste which is involved in much of the small scale production of today. It should also be borne in mind that coal mining represents a dissipation of capital, that when the coal is gone, the resources of the area will be permanently diminished.

Oil

The discovery of oil in Eastern Kentucky dates from 1819,[3] at which time a well put down for salt in the valley of the South Fork of the Cumberland River in McCreary County near the Tennessee line, struck oil at a depth of several hundred feet. No important oil discoveries were made until the late seventies and there was no considerable production until the late nineties, although more or less desultory drilling was done during the interval. Since the late nineties, and especially since 1900,[4] development has been very rapid. Today, seven out of the nine commercially productive sections of Kentucky are in the Mountains.

These seven sections are as follows:

(1) The Wayne-McCreary fields near the Tennessee line.
(2) The Estill-Lee-Powell-Wolfe-Menifee fields to the southeast of the Central Blue Grass.
(3) The Lawrence County fields.
(4) The Magoffin-Johnson fields.
(5) The Floyd-Knott-Pike-Knox County fields.
(6) The Martin County gas field.
(7) The Morgan County oil and gas field.

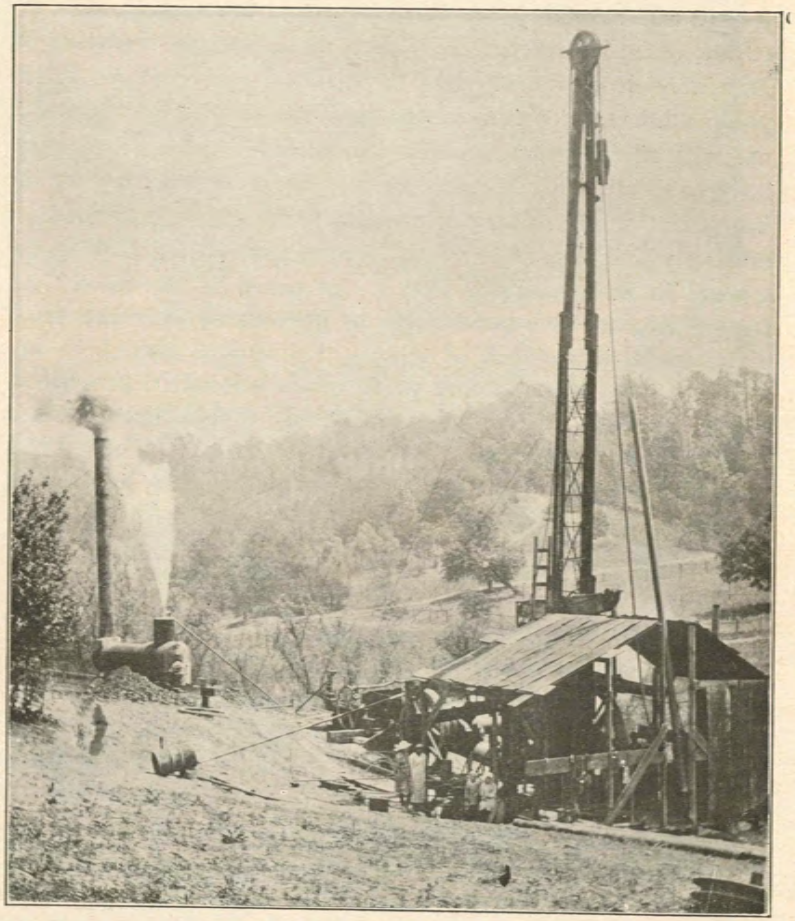

PLATE XLIX. DRILLING FOR OIL NEAR TORRENT, WOLFE COUNTY.

Of these fields, the Estill-Lee-Powell-Wolfe-Menifee section is the largest producer of oil in the state. In 1919, the production of 8,500,000 barrels constituted 90% of the total state production.

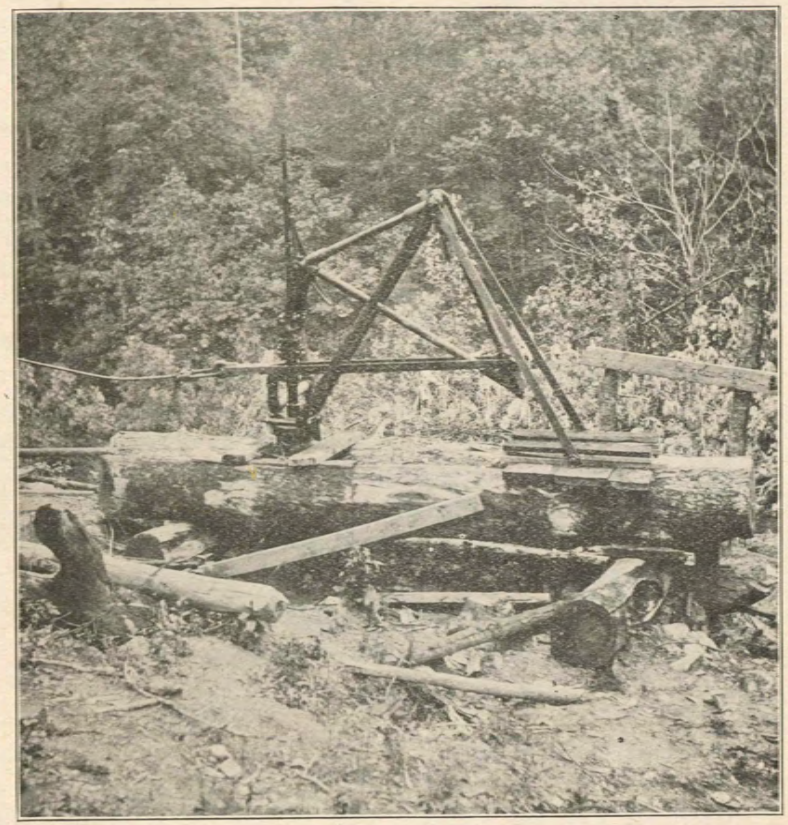

PLATE L. PUMPING OIL FROM A WELL NEAR IRVINE, ESTILL COUNTY.

Prior to 1899, the annual production for the entire state was less than 20,000 barrels. In 1910, the total state production amounted to only 468,744 barrels. By 1916, it had risen to 1,144,750 barrels, by 1918, to 4,350,950 barrels, and by 1919, to 9,229,473 barrels. In June of 1919, the production for the single month nearly equalled the entire 1916 production. This marked the peak of production. Decline in production, both for the

Mountains and the entire state, has set in definitely in spite of the drilling of numerous new wells and the discovery of some new pools. The total production for 1920 was only 8,546,027 barrels, a drop of 680,445 barrels from the peak figure of 1919. The fall in production has been accompanied by a decrease in the revenue derived from the tax on oil. In 1920, the tax, even with the decreased production, netted the state $281,860.21, but in 1921, this amount had falln to $270,939.85.[5]

Oil production, in the counties in which it has occurred, has produced a great deal of wealth, the total probably in excess of $75,000,000. The value of the production in 1918 alone was $9,748,542, and in 1919, $23,084,243. Despite this fact, it is doubtful whether the oil producing counties have benefited directly and permanently to any considerable extent. In many cases, the original holders of the land derived little or no financial profit from the discovery of oil, the returns from the exploitation of the resource going outside the area. With the depletion of the pools and the abandonment of the wells, the economic structure collapsed, leaving the region in worse condition than it was prior to the discovery of oil. This is not the result of the fact that the existence of an oil pool in an area is an inherent handicap, but results from the nature of the exploitation and the failure to safeguard the future during the period of exploitation.

Gas

The existence of natural gas in Kentucky has likewise been known since the time of early settlement, but production in a commercial way has occurred only within recent years. The Martin County field, the first to be opened and no longer an important producer, began production in 1893, but the gas was not utilized to any considerable extent until 1905. The Menifee field, the second area developed in Eastern Kentucky, came into extensive production about 1913, which was followed by a rapid depletion of the supply of gas. The following table taken from "Conversation of Natural Gas in Kentucky" by W. R. Jillson, (1922) shows the existing situation in the various gas pools of eastern Kentucky. The importance of eastern Kentucky as a

producer and the importance of the asset in the area will be realized if it is remembered that 19 out of the 31 fields are in the Mountains.

Natural Gas Pools of Eastern Kentucky

A. Gas pools of yesterday, old or abandoned.
   1. Martin County.
   2. Menifee County.
   3. Monticello, Wayne County.

B. Gas pools of today. Production used in Kentucky towns and cities.
   4. Barbourville, Knox County.
   5. Beaver Creek, Floyd County.
   6. Elk Fork, Morgan County.
   7. Flat Gap, Johnson County.
   8. Frozen Creek, Breathitt County.
   9. Ivyton, Magoffin County.
   10. Prestonsburg, Floyd County.
   11. Redbush, Johnson County.
   12. Williamsburg, Whitley County.
   13. Winn, Johnson County.

C. Gas pools of tomorrow. Size undetermined, but probably of commercial importance. Not connected to pipe lines.
   14. Island Creek, Owsley County.
   15. Mize, Morgan County.
   16. Oneida, Clay County.
   17. Newcombe Creek, Elliott County.
   18. Rock Fork, Knott County.
   19. Sexton Creek, Clay County.

In 1921, production of commercial natural gas in Kentucky was approximately 4,742,000 M. cu. ft. and consumption was practically four times that amount. In view of the decline of the productivity of the fields, the excess of consumption over production, and the rapidly growing list of domestic consumers, an understanding of the actual situation and a program looking toward conservation of the resource are urgently needed.

The two principal users of natural gas are the public utility corporations and the carbon black industry. The extensive pipe lines of the public service corporations extend in many directions through the state, serving a total of over 75,000 consumers and 62 cities and towns in Kentucky. Carbon black is produced in the gas fields or near the gas producing area. These conditions enable the carbon black industry to compete successfully with

the public service corporations and to use gas for a purpose which apparently involves an economic waste in an area such as Kentucky where domestic consumption is more than sufficient to absorb the entire supply produced in the state.

Gas resources are very limited. Commercial exhaustion under present conditions of use is near at hand. Conservation, which implies not preservation but a wise use of the resource, should be practiced. Irrespective of so called "vested rights," wasteful uses should be eliminated. This would mean at least the regulation of the use of natural gas in the manufacture of carbon black and the prevention of wastes which occur in connection with gas field operations and domestic and industrial consumption.

Bituminous Sandstones

Bituminous sandstone, or asphalt rock, a valuable material for road construction, is known to occur near Soldier in Carter County, but the heavy overburden prevents exploitation. Deposits elsewhere, so far as known, are too thin to pay for working.

Clays

Deposits of clay of potential economic importance occur in many of the counties of eastern Kentucky, though development of the resource has been limited to a few areas where the deposits are of high quality and transportation facilities are good.

The most extensively developed, as well as the most valuable deposits, are the Olive Hill fire clays, which occur as discontinuous beds over an area of approximately 660 square miles.[6] The character of the clay, as well as the thickness of the deposit, varies greatly from mine to mine. In some places the clay disappears, in others, the beds may reach a maximum thickness of as much as 29 feet. Sometimes the major portion of the deposit is a flint clay; again it is a semi-hard or semi-flint clay Sometimes the clay mined is plastic.

Development of these clays has been confined to a narrow zone not exceeding ten miles in width along the Chesapeake and Ohio Railroad, although prospecting by drilling has revealed large bodies of clay at greater distances from the railroad. Wherever mines are so located that hauls of several miles are necessary, narrow gauge railroads are used to transport the clay.

Valuable deposits of fire clay also occur in the Ashland district. These clays are plastic, with thin bands of flint clay. These plastic clays are used in the manufacture of fire brick.

Floodplain clays, which are usually somewhat sandy, but suitable for the manufacture of common brick and used for the purpose, occur underlying the terraces which border the Ohio River and at various other places.

The clay resource of eastern Kentucky is the foundation of a manufacturing industry, the products of which embrace common brick, rough texture brick, drain tile and fire brick. The location of these various industries is shown in Fig. 17 and in the accompanying tabulation by counties.

FIG. 17. DISTRIBUTION OF THE CLAY INDUSTRIES.

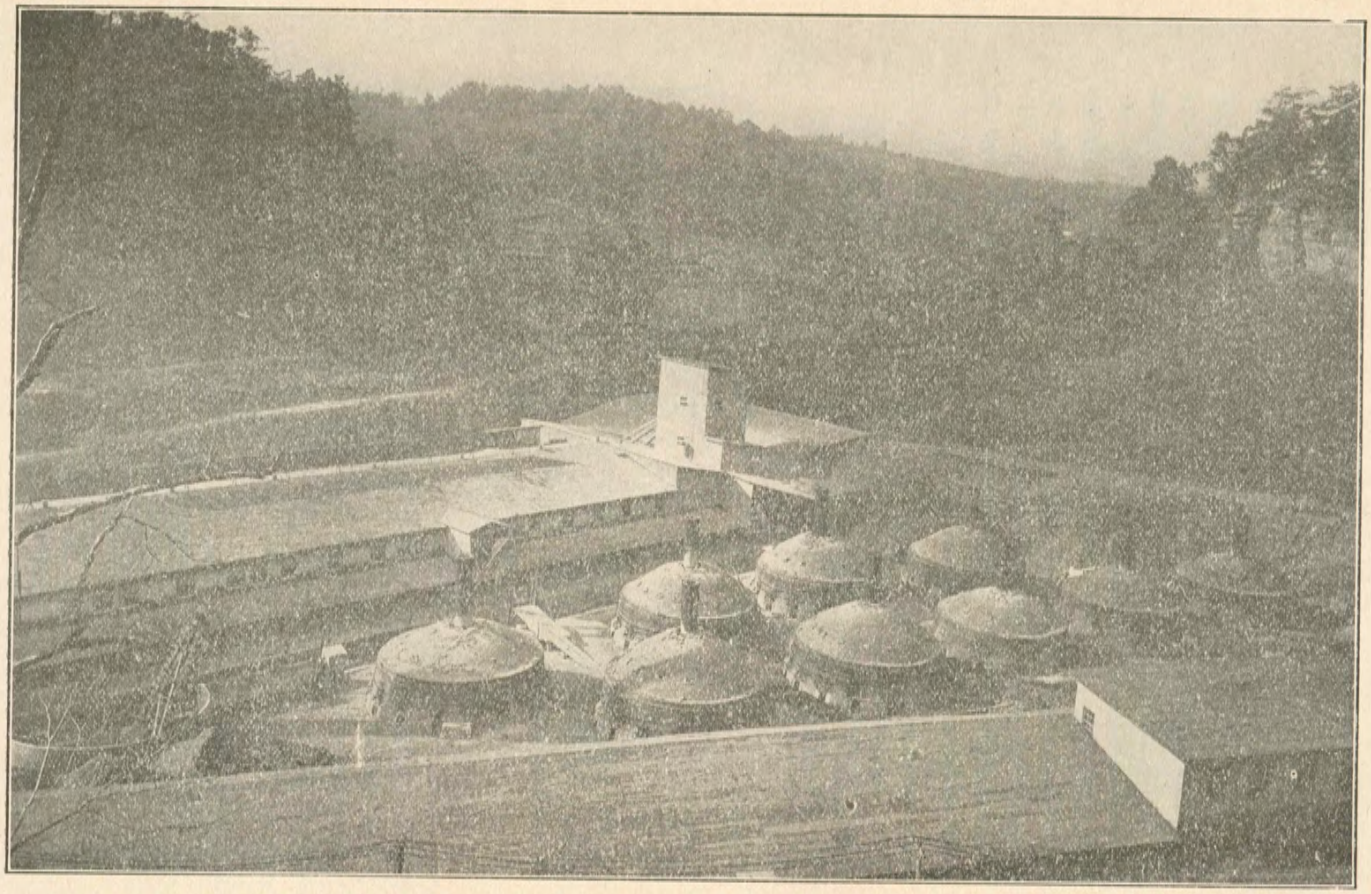

PHOTO BY W. R. JILLSON

VIEW OF LOUISVILLE FIRE BRICK WORKS, GRAHN, CARTER COUNTY, KENTUCKY.

DISTRIBUTION OF THE CLAY MINES AND CLAY WORKING INDUSTRIES OF EASTERN KENTUCKY BY COUNTIES.

County	Clay Mines*	Common Brick Plants	Rough Texture Brick Plants	Drain Tile Plants	Fire Brick Plants
Boyd		J. J. Gates and Co., Ashland Means and Russell Iron Co., Bellefonte			Ashland Fire Brick Co., Ashland.
Carter	Kerns Mining Co., Aden J. H. Burdette, Denton Harbison-Walker Refractories Co., Denton J. D. Patton, Soldier J. D. Bannon Pipe Co., Soldier Harbison-Walker Refractories Co., Soldier				Louisville Fire Brick Works, Grahn. Ashland Fire Brick Co., Haynard. General Refractories Co., Hitchins. Harbison-Walker Refractories Co., Olive Hill. General Refractories Co., Olive Hill.
Greenup					Chas. Taylor Sons Co., McCall.
Knox		Barbourville Brick Co., Barbourville			
Powell		Atkinson and Baker, Stanton			
Rowan	Gilmore Fire Clay Co., Gates General Refractories Co., Morehead Ironton Fire Clay Co., Enterprise				Kentucky Fire Brick Co., Haldeman.
Whitley		Corbin Brick Co., Woodbine	Corbin Brick Co., Woodbine		
Wolfe				Hazel Green Brick & Tile Works, Hazel Green	

*The only clay mines listed are those from which the clay is hauled some distance to the place of manufacture.

The manufacture of common brick, rough texture brick and drain tile has not attained any considerable proportions, the product supplying only the local market which is limited in extent. The clays manufactured are in most cases alluvial in origin, though some residual clays are used near Corbin.

The manufacture of fire brick has attained considerable importance. The early production of the Olive Hill clay was largely shipped out of the area, but since about 1895, the construction of manufacturing plants has proceeded steadily until there are at present ten factories with a combined daily capacity of 445,000 nine inch brick.[7] This is 85% of the total state production of fire brick.

Development of the clay industry, wherever it has occurred, has followed railroad construction. Development in the Olive Hill district has been rapid because of the large supply of high grade clays, good transportation and proximity to the coking coal district and good markets. The major future development may be expected to occur by an expansion of the industry in this same district.

Sands

The more massive and compact sandstones have extensive local use for foundations and chimneys and, in some cases, the character of the rock is such that it can be used in building construction. The crushed rock is extensively used as road and railroad ballast and in the manufacture of concrete.

Sands mined in eastern Kentucky also find use as molding sands and in the manufacture of mortar, plaster and concrete. Some of the sands are suitable for the manufacture of glass[8] and are so used, though in a very limited way at the present time. Such sands are being mined at Tygart at the present time. According to Richardson, the supply of sands is adequate and freight costs are such that sands from northeastern Kentucky can be delivered to West Virginia points at a price which should insure the success of any expansion of the industry.[9]

Iron Ores

Local iron ores were the foundation of an iron industry of early importance in both the Red River district and in Boyd, Carter and Greenup counties. With the introduction of coke for fuel instead of charcoal and with the discovery of the rich Lake Superior ores, the early furnaces were forced to suspend operations. Many of them still stand in a fair state of preservation as a reminder of the former importance of the industry.

Water

Water for domestic use on the farms is obtained either from shallow wells in the river gravels or from springs on the nearby slopes. Stock obtain water from the creeks which contain pools, even during the dry season.

In the coal mining communities, an adequate supply of drinking water of satisfactory quality is frequently lacking. Many of the springs are small and go nearly dry in the summer. Contamination also frequently occurs where few sanitary precautions are taken. In the larger camps, as at Lynch, several large springs furnish a satisfactory supply of good water.

The cities and towns obtain their water supply from the creeks and rivers. In some cases, this furnishes an excellent supply of good water, in other cases, the water is hardly safe for drinking. Water pumped from the Kentucky River, especially at low water stages, is often contaminated and always muddy. Middlesboro, which obtains water from Little Yellow Creek, a stream fed by large springs from sandstone, and not in an area where contamination is likely to occur, has a satisfactory water supply. The water supply of Pineville is similarly secured from a spring fed creek not subject to contamination.

Water for manufacturing plants is sometimes secured from large springs or it may be secured from artesian wells in some areas, as in the vicinity of Middlesboro. Such wells secure water from the Lee conglomerate.

Water power possibilities are limited, but some of the tributaries of the Cumberland should develop a small amount of power and the Cumberland river at Cumberland Falls offers the opportunity for a considerable development.

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CHAPTER VII.

CITIES AND MANUFACTURES

Cities in the Mountains are, with few exceptions, located on major drainage lines. This is universally true in the area of the creek bottom settlements. In this region, lines of communication naturally focus upon the principal valleys, and it is in these valleys that the larger urban communities are located. Further, these valleys afford the only areas where topographic conditions furnish sufficient level land for urban aggregations. Examples of cities so located are Jackson, Hazard, Whitesburg, Pikeville and Prestonsburg. A location on a main drainage line may also control a break in a mountain barrier as in the case of Pineville, located where the Cumberland River cuts through Pine Mountain. Middlesboro, though not on a main drainage line, similarly possesses a pass location, being strategically located with reference to Cumberland Gap, the only feasible route across Cumberland Mountain for many miles.

In the area of ridge top settlement, the streams are not always a determining factor in city location. In many of the more level portions of the plateau, where much of the older surface has been preserved, no one location possesses any particular topographic advantage which makes it markedly superior as a city site. Hence, in this portion of the Mountains, the determining factor has in many cases been the location of the railroads, the larger places springing up with the development of modern transportation. Towns with such locations are Corbin, primarily a railroad center, London and Pittsburg.

County seats are centrally located with reference to the county, and as most of the counties are not large, the county seat is not far distant from any portion of the county. However, the character of the roads makes even a few miles of travel a serious matter so there has been a considerable multiplication of cross road centers and country stores though these should not be classed as urban development.

In addition to the cities within the area, marginal towns, of which Ashland and Catlettsburg are the best examples, derive a portion of their prosperity from the mountain hinterland,

though their future is only in part tied up to that of the area on the margin of which they are located.

The towns and cities of the mountain area, including even those of the margin, are in few cases distinctively southern in plan, Pineville furnishing one of the few examples of a town built around the court house square. This failure to follow the plan so common south of the Ohio River may be ascribed to regional topographic conditions which have controlled both the plan and the direction of growth of the community, and to the fact that much of the urban development has been very recent and associated with mining development.

In the area of creek bottom settlement, most communities are linear in character. Level land is so limited in amount that urban development is seriously handicapped and the town must either extend up and down stream or the houses must cling to the sides of the hills which shut in the valley on either side.

Urban development in the more level ridge top areas is not so restricted and a more symmetrical type of urban growth results. In the case of Middlesboro, the city lies in a basin of such size as to allow for a considerable expansion on level land, but this is an exception. The border towns on the Ohio River, Ashland and Catlettsburg, extend along the river front, but this is in large part due to the former importance of the river as a highway as there is an abundance of level land to care for expansion.

In general, there is no definite plan which characterizes the mountain towns. Most of them are of recent growth, many are mining centers or dependent upon the mines and their plans represent individual adjustments to local topographic conditions and the individual convenience of the community. In only a few cases does this manifest itself by grouping the town around the court house.

In many areas, cities and towns are strikingly similar in character, differing essentially only in size and the exact degree of industralization, but in the Kentucky Mountains, the diversity of cause which has led to urban development has also had the effect of markedly affecting the character of the urban aggregations.

Some of the agglomerations are mining camps expanded to city size with all the economic life of the community centered around the activities of a single great mining company. Jenkins and Lynch afford examples of such communities. In such centers of population, there is no industrial development aside from coal mining and civic pride is lacking. These communities stand in a class by themselves and in no way resemble in appearance or character the other cities or towns of the area.

In other cases, the cities, though dependent primarily upon coal mining for their support, have developed independently of any coal mining company, and small manufactures, based upon local resources, have come into existence. These small industries may embrace stave mills or handle factories or some other industry based on the timber resource, canning factories, and brick plants or other clay working factories. Towns of this character were quite commonly county seats or important local centers prior to the development of the coal resource and have profited since the coming of railroads by their early start. The degree of growth which these towns have experienced has been largely dependent upon the extent to which the coal has been exploited. In some cases, as at Jackson and Prestonsburg, the metamorphosis of the original center has been much less pronounced than in the case of such cities as Hazard and Harlan. In the two latter cases, the alteration has been so extensive that almost no traces of the original settlements remain. The rapidity of growth of population is an index of the degree to which the various towns have been affected by coal mining developments. The relation of mines to such towns is shown in Fig. 15.

Middlesboro is also in that class of cities which serve as centers of coal mining areas, though its early prosperity traces back to the influx of English capital at an earlier date.

The marginal cities of Ashland and Catlettsburg fall into a class by themselves, although in some respects they resemble such towns as Middlesboro. Their marginal location, however, renders them quite different in character from the mountain towns and makes them more largely independent of the fortunes of the area for a portion of which they act as distributing centers.

In the counties where railroads have not penetrated and where conditions similar to those existing in all counties prior

to the past two decades exist, no urban population, in the ordinarily accepted use of the term, exists. However, communities consisting of a handful of houses clustered about a few stores and the court house are located in each county. These centers suffice to supply the limited needs of the rural community, the per capita purchasing power of which is low. Communities such as Hyden and Hindman belong to this class.

Urban development in the Mountains has been very slight and has in larger part been confined to the past two decades. In 1800, Prestonsburg, in Floyd county, with a population of six, was the only mountain settlement mentioned in the United States Census in the section on "Towns and Cities." By 1810, Prestonsburg with a population of 32 and Barbourville, in Knox County, which possessed a population of 55, were important towns and the largest settlements within the area. Even as late as 1870, only Ashland and Catlettsburg, both in Boyd County, had populations of more than 1000. By that date, these two places had populations of 1,459 and 1,019 respectively. Most of the county seats at that time had populations not exceeding 100. In 1900, only three towns with a population of 2,500 or over existed in the Mountains. These three were Ashland (6,800), Catlettsburg (3,081), and Middlesboro (4,162), and of these three, only the last named is in the Mountains in the strict sense.

Since 1900, however, urban growth has been somewhat more rapid and the number of smaller towns has increased noticeably. In 1920, there were sixty-one incorporated places, and of these, eight were urban centers with a population in excess of 2,500. In addition, seventeen other towns had populations in excess of one thousand and eleven places had populations between five hundred and one thousand.

The following tabulation shows the growth of population of the larger incorporated places for several decades, as shown in the census returns.

GROWTH OF POPULATION IN THE URBAN CENTERS, BY DECADES.

Name of City or Town	1920	1910	1900	1890	1880	1870
Ashland, Boyd Co.	14,729	8,688	6,800	4,195	3,280	1,459
Middlesboro, Bell Co.	8,041	7,305	4,162	3,271		
Hazard, Perry Co.	4,348					
Catlettsburg, Boyd Co.	4,183	3,520	3,081	1,374	1,225	1,019
Jenkins, Letcher Co.	4,707					
Corbin, Knox & Whitley Co.	3,406	2,589	1,544			
Pineville, Bell Co.	2,908	2,161	2,072	83		
Harlan, Harlan Co.	2,647	657	557			

(Data from U. S. Census.)

A consideration of the increase in the population of the incorporated towns and cities shows the effect of the coal mines in such increases. Of the important towns with populations of 500 or over in 1920, fifteen were not even listed in the Census of 1900, and in the remaining twenty-one, a large portion if not all of the increase in population between 1900 and 1920 was the result of an increase in the development of the coal resource.

The two marginal cities, Ashland and Catlettsburg, constitute the largest urban aggregation, either within the Mountains or on their borders. Though separate municipalities, the two cities form essentially one community. Of the two, Catlettsburg, the county seat, is the older; but Ashland, though younger, has outstripped Catlettsburg both in population and the amount of industrial development.

Their location on the Ohio River was of early significance, but at present, though some freight is still transported by river, both by barge and packet, the location on the river highway is only a minor factor in the present importance of the two cities. The size of the wharf boat at which packet steamers dock is indicative of the small amount of commerce which the river handles at the present time. The major locational advantage which these two towns possess is that their site represents a convergence of land highways. The Ohio river breach witnessed some of the earliest railroad construction in this area (See Fig. 15) and Ashland and Catlettsburg, particularly the former, profited by this early construction. Later railroad

building has given these two cities connections to the north and northwest as well as to the east by way of the Norfolk and Western Railroad. In addition, the various lines of the Chesapeake and Ohio Railroad, together with the various small roads which act as feeders, focus upon Ashland the trade of the Big Sandy and Levisa Fork areas, as well as afford connections with West Virginia points and the east.

This fortunate location has made these two cities important retail centers and distributing points for the large area embraced in the drainage basins of these rivers. This location with reference to lines of communication, coupled with the favorable topographic conditions for city growth afforded by the location of the cities on the level land of the Ohio river terraces, well above high water levels and consequently free from flood danger, has led to a considerable industrial development based upon easily accessible raw materials.

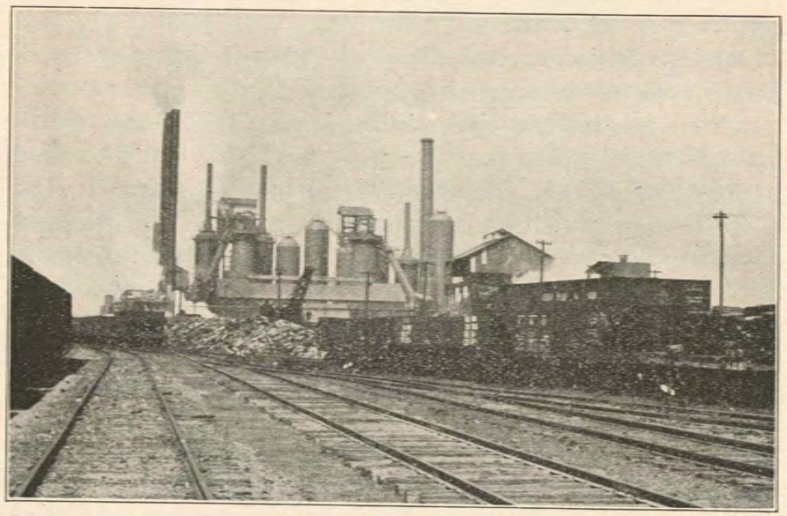

PLATE LII. STEEL MILL AT ASHLAND.

In this industrial development, the iron and steel industry and the production of coke predominate. The dominant position occupied by these industries is the result of the favorable location which Ashland occupies with reference to the coal fields of Kentucky and West Virginia. The fire clays of the area

furnish the basis for the fire brick industry and the forest resource supplies part of the materials for a fairly extensive leather and tanning industry. The hides come in large part from outside the area. In addition to these major activities, a wide variety of minor manufactures exists.

PLATE LIII. THE BUSINESS DISTRICT OF ASHLAND.

The growth of Catlettsburg has been rather slow, but Ashland has experienced a rapid increase in population, especially during the decade ending in 1920. During that ten year period, the population increased from 8,688 to 14,729 as against an increase for Catlettsburg for the same period from 3,520 to 4,183. Ashland is a thriving community with many miles of paved streets and excellent municipal improvements. There is occurring at the present time a rather rapid transformation of the business section to match the increase in population. All the evidence seems to indicate that conditions exist for the development of a major population center.

Middlesboro, which is the largest city within the Mountains, lies on the old Wilderness Road near Cumberland Gap and derives some of its importance from the fact that it controls one of the few feasible breaks in the eastern mountain barrier and

one which is utilized by a railroad. In addition, the city is located in a basin of considerable extent which allows expansion on level land.

Middlesboro owes its early growth to an influx of English capital at a time when conditions were not favorable for development on the scale attempted. Traces of this premature attempt to exploit the resources of the area still remain in the form of manufacturing plants and elaborate buildings altogether unsuited to the area at an early date. This boom was succeeded by a period of depression from which Middlesboro is emerging at the present time, as is indicated by the steady growth of population.

Middlesboro depends primarily upon the trade of the adjacent coal fields. Manufactures at present are only slightly developed, are all small, and do not promise to be of major importance in the future.

PLATE LIV. THE MAIN BUSINESS STREET OF MIDDLESBORO.

The city is pleasing in appearance, with wide streets and many fine business blocks. In the residence section, the streets are well shaded and the houses are attractive. Coal mines are far enough removed from the immediate vicinity of the city and

the age of the community is great enough to make it quite different in appearance and character from the mining towns of recent growth.

PLATE LV. A RESIDENCE STREET IN MIDDLESBORO.

Hazard, the county seat of Perry County, has witnessed the remarkable growth characteristic of towns situated in areas where mining development has been very rapid. From a population of less than 100 in 1890, the population has increased, until in 1920, it was 4,348. At present, it is probably in excess of 5,000. Growth has been so rapid that the town is still largely in the "brick and mortar" stage. Everything is new and raw and evidences of rapid growth are everywhere at hand. Old Hazard still exists, almost submerged and entirely surrounded by the recent construction of modern brick blocks several stories in height.

This rapid growth has been made possible by and is solely the result of the extension of the Louisville and Nashville Railroad up the Kentucky River and the development of the coal in the vicinity of Hazard. The town has no resource other than

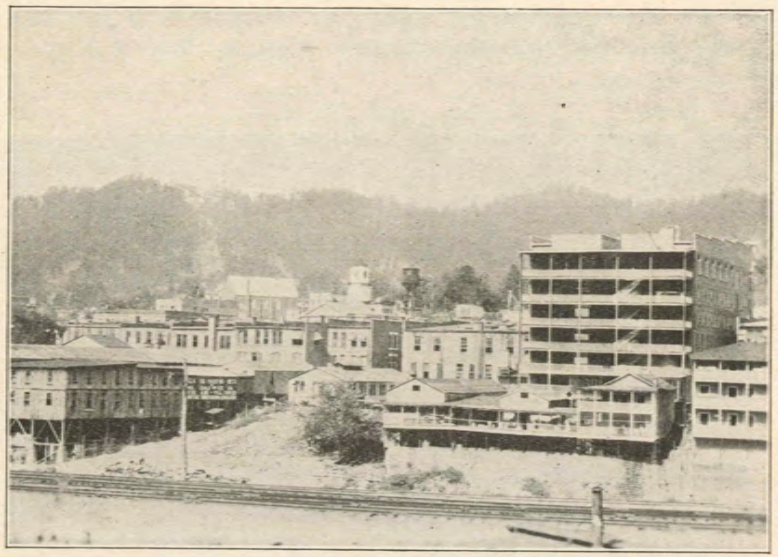

PLATE LVI. A VIEW OF THE BUSINESS SECTION OF HAZARD. Perry County. From the south side of the Kentucky River. The building at the right is a new hotel.

the fact that it is a retail and wholesale center for the mining communities which adjoin one another almost continuously along the Kentucky River. Even the topographic conditions are unfavorable for city growth, as the area of the level land adjacent to the river is limited.

Jenkins, the third incorporated city in size in the area and the second in size within the Mountains, is located in a valley of fair width on the west flank of Pine Mountain near Pound Gap, which furnishes a rather easy approach to Virginia, though no railroad utilizes this break in Pine Mountain.

Jenkins, like Hazard, is a mining town, but is quite different in character, as it is a community owned and controlled by a mining company rather than a city which has grown up in response to the needs of a group of mines. The development has resulted in the building of a very attractive community, with good schools, paved and surfaced streets, and facilities for recreation which include a company club house, a recreation building, a public park and a ball park. It represents one of the best of such developments in eastern Kentucky. Lynch and Benham, though unincorporated in 1920 and hence not listed by the census, represent development of similar character.

Corbin, with a present population of 3,406, is the fourth city in size in eastern Kentucky. Although there is some coal mining in the vicinity of Corbin, the size of the city is the result of the fact that railroad shops are located there and that the town is a focus for railroad lines. Corbin is located in a rather level portion of the plateau. In consequence of this fact, railroad construction has not been so restricted as to route as in the more highly dissected portion. Therefore, the lines which utilize this level portion of the plateau in making the crossing of the Mountains focus at Corbin.

Pineville, one of the smaller of the urban centers, is, like Middlesboro, located where the Wilderness Road crosses a gap, being situated where the Cumberland River breaks through Pine Mountain. Like Middlesboro, it derives its importance from the fact that it serves as a center for the coal mining camps of the adjacent area. It is, however, of much more recent growth than Middlesboro, though entirely lacking in the unfinished character which is so marked at Hazard.

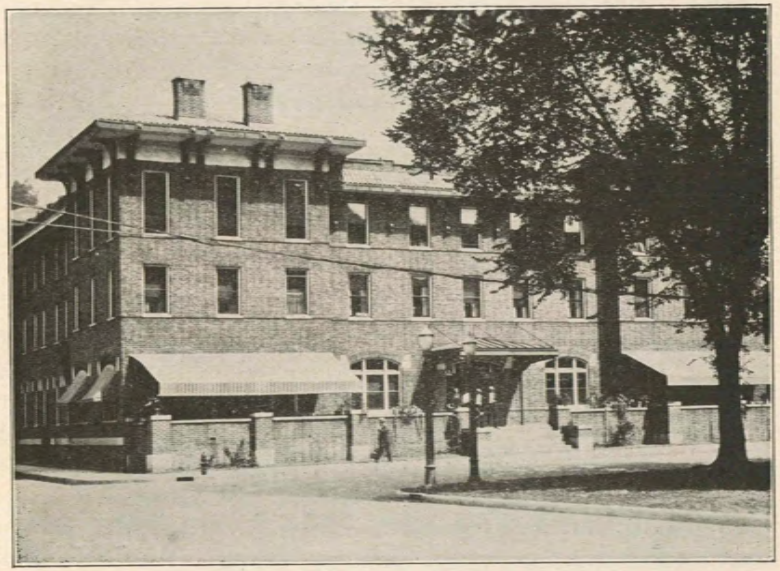

PLATE LVII. THE HOTEL AT PINEVILLE.
This structure is characteristic of the buildings making up the business section of the town.

Pineville is compactly built, with excellent pavements and good buildings. For a place of its size, it possesses a remarkably fine business section. It is one of the few places in the Mountains in which the business section is centered around the court house square.

Harlan, the smallest of the incorporated urban centers, is, like Hazard, the center of a coal mining area and has enjoyed a phenomenal growth during the past decade. In 1900, the population was only 557, and in 1910, but 657, yet by 1920, it had increased to 2,647. Harlan possesses no manufactures and, except for the coal mining activities of the area, would be of only minor importance.

There is a long list of minor centers of population, many of which may repeat during the next decade the increases in population which have occurred in the towns with present populations in excess of 2,500. Among the more important of these places may be mentioned Barbourville (1,877), Fleming (2,069), Hellier (1,884), Jackson (1,503), London (1,707), Louisa (2,011), McRoberts (2,146), Olive Hill (1,395), Paintsville (1,383), Pikeville (2,110), Prestonsburg (1,667), and Williamsburg (1,767). Some places, as Jackson and Prestonsburg, have been affected but little by coal mining operation; others, as McRoberts, are mining camps of considerable size. In still other cases, as Bourbourville, the towns are dependent in part upon coal mining and in part upon small manufactures and the rural community. Few towns on railroad lines are entirely free from the effect of the coal mines. In many cases, these smaller towns are also county seats. To draw a lower limit of population and characterize accurately the various smaller population units is beyond the limits of this particular study, as different towns have individual characteristics which would practically compel separate consideration of each.

The present urban centers forecast the character of future city development within the area. Further, the rapid increase of aggregations of population which has characterized the past two decades may be expected to persist until such time as the coal resources of the area are thoroughly exploited.

Urban growth within the area will probably be limited to the development of a relatively large number of centers of rather

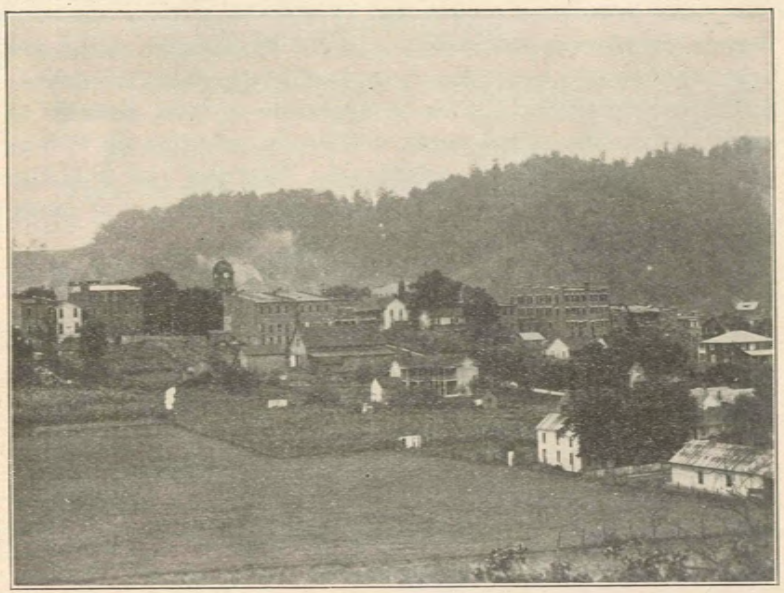

PLATE LVIII. A VIEW OF JACKSON, THE COUNTY SEAT OF BREATHITT COUNTY.
Looking north across the Kentucky River.

small size, rather than to the growth of two or three major foci of population. This result will be brought about by topographic conditions which do not admit of the concentration of transportation lines upon one or two areas, but favor equally a large number of localities in the three principal drainage basins. In quite a different manner, topographic conditions hinder the growth of large cities within the area in that, in most parts of the Mountains, few large tracts of level land exist. Even with the present relatively small cities, the restriction imposed by the small amount of level land has been a serious handicap, cities being forced to extend themselves in a linear direction instead of spreading out uniformly in all directions.

These smaller centers which will develop will probably never possess extensive manufactures, but will serve instead as distributing centers and markets for the mining population. In some cases, the major activity may be distribution and again the retail trade may dominate. This will be determined by the size of the area tributary to the town. All of the more impor-

tant minor population centers may be expected to repeat in some degree the phenomenal growth enjoyed by Hazard within the next twenty years as the coal resource becomes more developed. Small manufacturers, similar in character to those already in existence in many of the towns, will probably spring up to take advantage of cheap power afforded by local coal and to utilize the forest and clay resource as well as several others of much lesser present and future importance.

Here, as in other areas, the marginal location is most favorable for extensive urban development. In the Mountains, the most favored margin is the northern, for here the most diverse possibilities are presented and it is on or near such lines of contact of unlike areas that the maximum opportunity exists. Originating as two centers, but today, except for administrative purposes, virtually one, Ashland and Catlettsburg are so located with reference to contiguous territory and should have a considerable future of expansion before them.

CHAPTER VIII

POPULATION AND WEALTH

Population

The total population of the thirty-four counties, which lie either wholly or in considerable part within the Mountains, was 637,911 in 1920, or the average density was slightly over 52.5 to the square mile as against a state average of 60.1. If incorporated places with a population of 2,500 or more are deducted, the rural population shows an average of 48.8 to the square mile in 1920 as compared with a state average of 44.3.

From the beginning, population was widely diffused, but has increased steadily in density since the date of the earliest settlement up to the present time. Although the early increase was in part the result of immigration, the increase between 1840 and 1900 was almost entirely genetic. Since 1900, however, there has been considerable immigration into the coal mining areas.

A gradual increase in population has taken place from the western margin up the main river valleys. In 1800, the density was less than two to the square mile except in the lower portions of the larger river valleys. By 1850, the general density of population was six to eighteen inhabitants to the square mile with a much greater density in the lower Big and Little Sandy basins. By 1890, the increase and the accompanying pressure of population on the land had forced the occupation of even the exceedingly rough country of the Upper Cumberland and Kentucky basins. By 1900, the density was everywhere from eighteen to forty-five to the square mile, and in the coal mining centers of the Upper Cumberland and Big Sandy basins, there was a concentration of forty-five to ninety to the square mile. Today, the density is even greater.

All that portion of the population residing outside of incorporated places with a population of 2,500 or more is defined as rural. Prior to 1870, there was no urban population under this definition, as Ashland passed the 2,500 mark shortly after that date. In 1920, the urban population constituted only 7.0% of

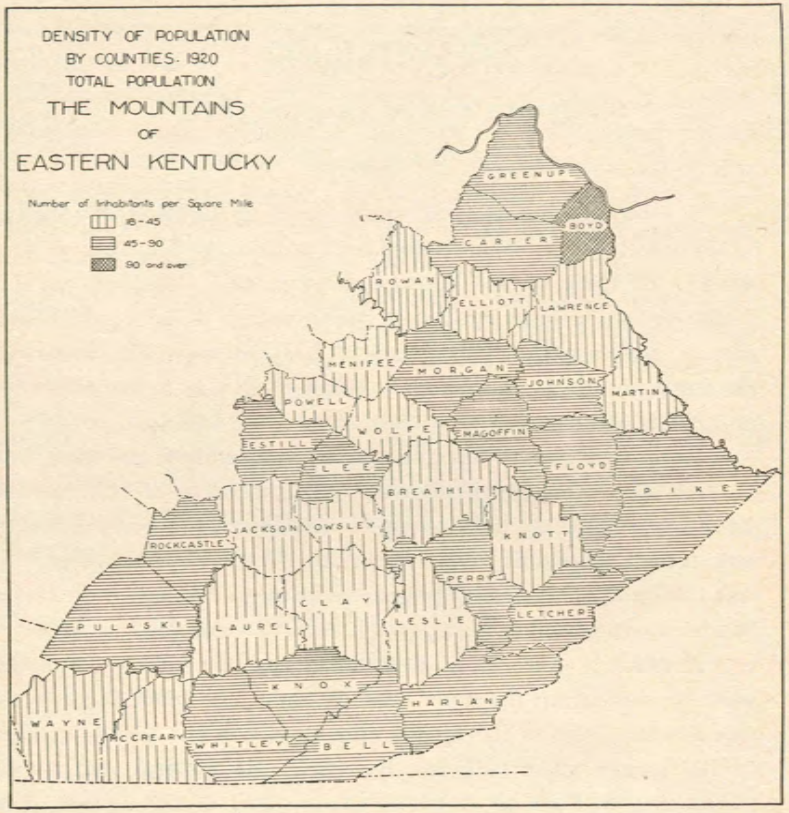

FIG. 18. DENSITY OF POPULATION (TOTAL POPULATION).

the total population as compared with a state average of 26.2%. Cities are limited to Bell, Boyd, Harlan, Letcher, Knox, and Whitley counties, though urban population is increasing, both in actual numbers and in relation to the total population. Rural population decreased in seven counties out of the thirty-four and increased in the remainder during the decade ending 1920. A portion of this increase, however, does not come from increased use of the land for agriculture but results from the development of many small mining communities, so small that the population is classed as rural. Actual increase in the population engaged in agriculture is very slight if such increase exists in any county.

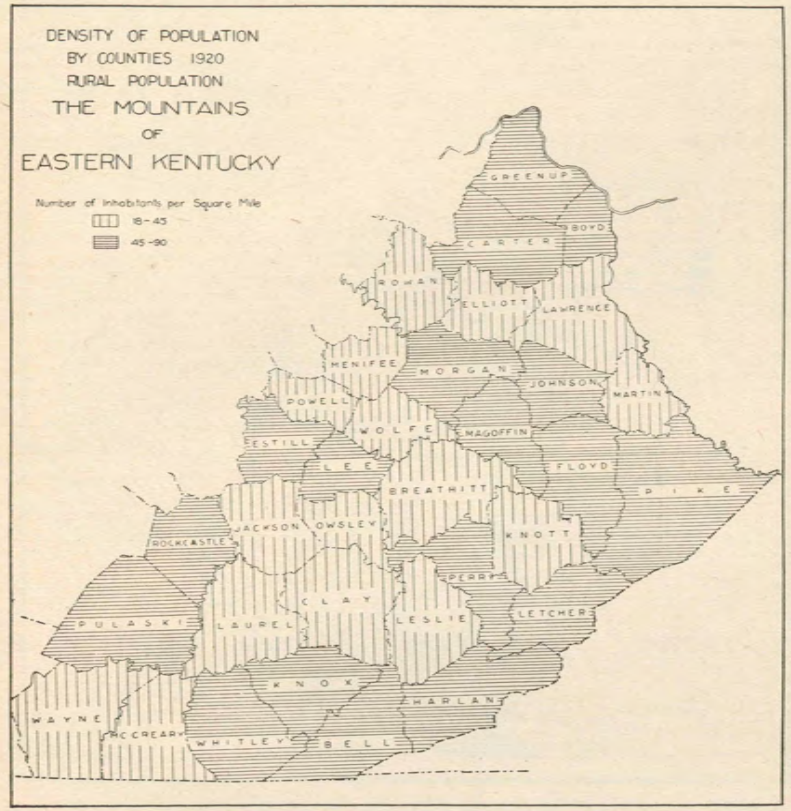

FIG. 19. DENSITY OF POPULATION (RURAL POPULATION).

Since the date of the first settlements down to the present time, the percentage of urban population has been far below the state average and even farther below the average for the United States. Kentucky has always been dominantly agricultural in character and has shared with other agricultural states the honors of standing low in the percentage of increase in urban population. From 1900 to 1910, Kentucky, together with Iowa and Nebraska, showed the smallest percentage of increase of urban population of any of the states in the United States, and the Mountains contributed in no small degree to this showing.

For a period of one hundred years, the isolation of the area was accompanied by the agricultural occupation of the land.

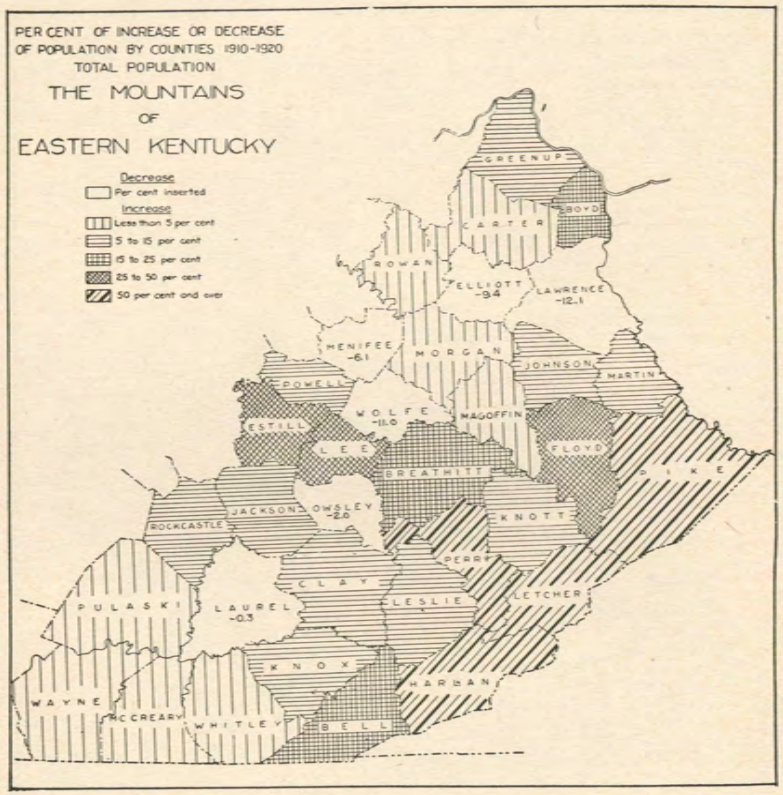

FIG. 20. PER CENT OF INCREASE OR DECREASE OF TOTAL POPULATION.

The exploitation of the timber resource was possible in only a very limited way, and of the coal, in even lesser degree. Every farmer was practically self sufficient. Prior to 1900, pioneer conditions existed in all of eastern Kentucky. The population was of fair density and the density increased with each decade, but development was retarded at least seventy years by isolation. Under those circumstances, urban development was impossible and unnecessary.

This condition has, however, been changed by the construction of railroads and the exploitation of the coal resource. Urban development is proceeding at a fair rate and many counties are already showing a loss of rural population. The shift which is just beginning in eastern Kentucky is the one which is character-

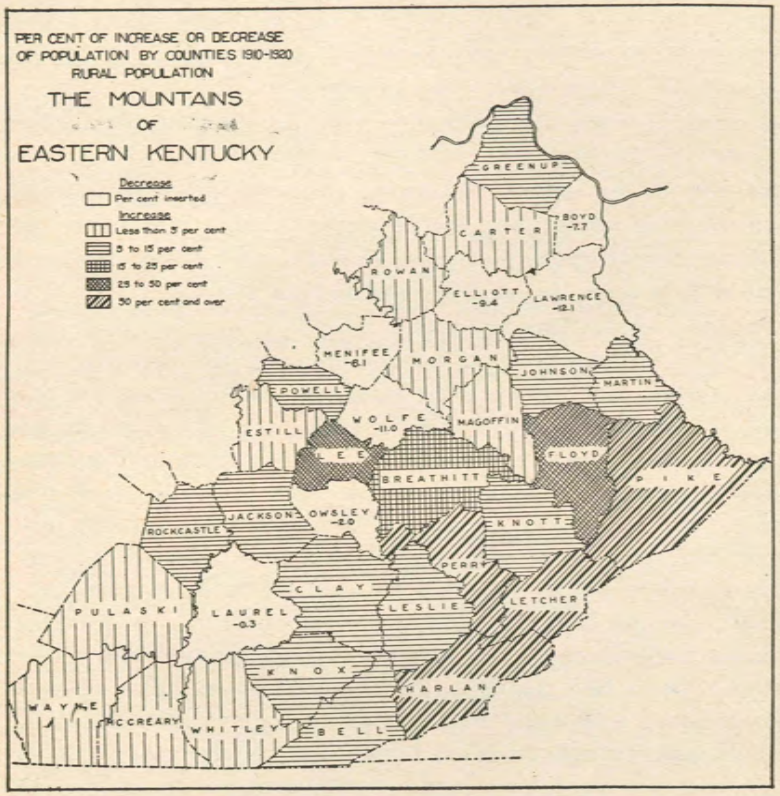

FIG. 21. PER CENT OF INCREASE OR DECREASE OF RURAL POPULATION.

istic in most portions of the United States, a movement from agricultural to industrial areas and particularly from areas of poor agricultural performance and promise. Census figures do not tell the full tale of such a shift in this area as small communities do not show as urban population even though the shift has been made from agriculture to mining. The next census will show a greatly increased urban population and a corresponding decrease in the rural element.

Early settlers in the Mountains were virtually all of American birth and American parentage and mostly from southern states. This is a characteristic which the area shares with most portions of Kentucky. The stock is in all probability in large part the same as that of the Blue Grass but it has been

modified by long isolation in an area of lesser opportunity. The transmontane settlers grew in wealth and culture, but in the Mountains, deterioration began as soon as population commenced to press upon the limits of sustenance. In addition, the lawless flocked to the area and reproduced their kind. Relief was not afforded by emigration because, immured in the Mountains, ignorance of opportunity elsewhere prevailed. In addition, the mountaineer is strongly attached to home and kindred, the hard life in some cases bred shiftlessness, and not infrequently poverty prevented escape from the area.

Although genealogical records are in many instances lacking, names and survivals in language and customs indicate plainly an English and Scotch Irish ancestry with a certain admixture of Germans and Hugenots. Immigration and emigration have been gradual and slight. The consequence of this origin and the genetic increase of population has been to preserve the ethnic type and to produce a population of extraordinary homogeneity. Even the physical characteristics are common. Coming from the same stock, intermarrying to a degree almost unknown in any other part of America, and leading the same type of life, this is in no way remarkable. The average mountaineer is lean and lank with rather high cheek bones. Both blonde and brunette types are found freely intermixed.

Not only has the mountain environment left its impress on the activities of the community, but it has left as well its stamp on the nature and mental processes of the mountaineers. The self reliance made necessary by isolation has developed an independence which manifests itself in a disregard of revenue laws and a disposition to avenge wrongs without recourse to processes of law. Conditions under which they have lived have made them almost unaware of the value of time. In the monotony of their lives, small events assume great importance. Strangers excite curiosity, even today, in all areas far from the beaten trail. Personal and family honor are very highly regarded and honesty is a regional characteristic.

No outsider, unless he has lived on terms of intimacy with the people, can appreciate the motives and prejudices which make the mountaineer different from the inhabitant of the plains. The tourist who notes and exaggerates peculiarities, as well as

the partisan who disseminates highly colored versions of the virtues of the mountaineer and is immediately in arms at the mention of an unpleasant fact, are both conveying erroneous pictures of conditions. In many cases, and with justice, characterizations in which emphasis has been laid upon regional peculiarities which are not fundamental are resented. It was true a few decades ago that the Mountains were "a backwoods where the civilization is that of the 18th century—where money is as scarce as in colonial days, and all trade is by barter," and that in 1878, Shaler, of the Kentucky Geological Survey, saw men hunting squirrels with old English "shortbows," but these are things of the past, not of the present. Dialect stories, accounts of moonshining and feuds convey an entirely erroneous impression of actual conditions in the mountain area today.

Failure attended all early attempts to establish foreign agricultural colonies in the area. None of the agricultural colonies established between 1880 and 1890 in various portions of Laurel County with the expectation of producing wine, garden truck and cheese met with success, the colonists either leaving or going into the coal mines. The names of places such as Bernstadt, Strassburg and Salzburg alone remain as reminders of the attempted agricultural occupation of the area.[1]

Few foreigners entered the Mountains before the era of railroad construction. As late as 1900, they formed less than 1% of the population except in the mining sections of the Cumberland Valley. The density was less than one inhabitant to the square mile, except in Laurel County, where it was one to four. In 1920, the percentage was still less than 1% except in areas of extensive coal mining. The following tabulation shows the distribution of native whites, native whites of foreign parentage, native whites of mixed parentage and foreign born white, as well as the distribution of the negro element of the population.

Up to 1900, there were relatively few negroes, in some counties practically none. The small mountain farm did not require slave labor and the hard conditions of life and lack of opportunity for domestic service have made the area unattractive to free negroes. In addition, the mountaineer has never taken kindly to negroes in the community. Kephart states[2] the moun-

RACE AND NATIVITY OF THE POPULATION—1920

Counties	Native White Native Parentage	Native White Native Parentage	Native White Foreign Parentage	Native White Mixed Parentage	Foreign Born White	Negroes	Indians, Japs, Chinese and all others
Bell	31,323	30,882	203	238	219	2,445	1
Boyd	28,218	27,020	619	579	311	730	22
Breathitt	20,414	20,392	9	13	14	185	1
Carter	22,389	22,267	48	74	26	59	
Clay	19,340	19,327	2	11	6	449	
Elliott	8,873	8,870	1	2	1	13	
Estill	15,352	15,327	8	17	13	4	
Floyd	26,820	26,636	122	62	173	428	6
Greenup	19,805	19,576	97	132	51	206	
Harlan	27,375	26,493	685	197	1,269	2,901	1
Jackson	11,681	11,662	4	15	2	4	
Johnson	19,493	19,412	34	47	48	67	14
Knott	11,498	11,490	1	7	4	153	
Knox	23,448	22,341	48	59	47	677	
Laurel	19,305	18,969	177	159	174	333	2
Lawrence	17,475	17,440	5	30	12	156	
Lee	11,670	11,607	11	52	13	235	
Leslie	9,998	9,992	3	3	1	98	
Letcher	21,926	21,493	320	113	641	1,900	
McCreary	11,634	11,566	22	46	14	28	
Magoffin	13,806	13,792	2	12	2	51	
Martin	7,630	7,617	4	9	23	1	
Menifee	5,728	5,720	2	6	1	50	
Morgan	16,503	16,494	5	4	4	11	
Owsley	7,763	7,755	3	5	1	56	
Perry	24,055	23,779	184	102	290	1,687	
Pike	46,578	45,906	522	150	860	2,039	
Powell	6,633	6,617	3	13	1	111	
Pulaski	32,965	32,715	86	164	69	976	
Rockcastle	15,329	15,299	10	20	7	70	
Rowan	9,432	9,400	11	21	13	22	
Wayne	15,561	15,506	13	42	6	641	
Whitley	27,071	26,883	67	121	78	600	
Wolfe	8,762	8,747	4	11	2	18	1
Totals	615,853	608,992	3,333	2,536	4,396	17.404	48

(Data from U. S. Census.)

taineer view in the following quotation: "I b'lieve in treatin' niggers squar. The Bible says they're human—leastways some says it does—and so there'd orter be a place for them. But it's some place else—not around me."

A few negroes were brought in by the early settlers. In 1800, there were 594, of whom 579 were slaves. By 1860, there were 8,174, of whom 7,016 were slaves. In 1900, the largest numbers were in Bell county (1,754) and Pulaski county (1,336). This was due to coal mining in Bell county, and in the case of Pulaski County, was the result of the fact that the county is only in part in the Mountains, hence the negro fits into the farm economy. By 1920, the number of negroes had increased to 17,404 or 2.7% of the total population.

Wherever extensive coal mining operations are carried on, negroes appear in considerable numbers. The same is true in the larger centers of population where opportunity for employment exists. Ashland, Catlettsburg and Middlesboro all contain a considerable negro population, this being especially true of the two Ohio River towns. With increasing development of the area and an increase in the demand for labor, both in the mines and in the urban centers, negroes will probably increase in numbers, though in the rural communities, they will be few in number as in the past.

Wealth

The mountain counties, which embrace 30.1% of the area of the state, contain a total of 11.6% of the state's total taxable wealth, having a valuation of $17,104 per square mile as against a state average of $44,134. Boyd County heads the list of mountain counties, not only as regards the total taxable wealth, but in taxable wealth per square mile and per capita as well. In general, the counties where the coal resources has been developed rank high in total wealth and wealth per square mile; the agricultural areas are far down in the column.

The small valuation per square mile of the counties where agriculture is still dominant indicates the undesirability of the land for the production of crops. By contrast, the valuation of the areas, where the mineral wealth has been developed, emphasizes the importance of mining in the economic development

TAXABLE WEALTH.

County	Total Taxable Wealth	Taxable Wealth Per Square Mile	Taxable Wealth Per Capita
Boyd	$24,687,637	$155,268	$842
Harlan	14,172,961	29,650	449
Perry	9,635,087	28,761	393
Wayne	6,191,111	12,952	381
Letcher	9,263,664	26,094	379
Leslie	3,810,328	10,215	377
Lee	4,353,407	21,871	365
Bell	12,262,318	31,933	360
Martin	2,544,378	11,208	332
Powell	2,207,327	12,195	327
Lawrence	5,699,472	13,505	323
Pike	15,374,049	19,736	310
Knott	3,604,349	10,356	309
Estill	4,724,596	18,600	303
Johnson	5,956,111	22,224	303
Rowan	2,811,148	13,349	297
Pulaski	9,182,663	14,622	296
Wolfe	2,580,834	11,221	293
Morgan	4,838,693	13,256	292
Menifee	1,639,836	8,078	283
Greenup	5,510,365	15,922	274
Carter	6,071,508	14,700	270
Knox	6,488,328	18,225	268
Whitley	7,396,296	16,756	266
Floyd	7,236,930	18,152	264
Clay	5,180,765	10,836	261
McCreary	2,846,386	7,010	243
Jackson	2,701,436	8,112	231
Laurel	4,578,530	10,242	231
Breathitt	4,574,379	9,470	221
Owsley	1,722,826	7,976	220
Rockcastle	3,258,172	10,510	211
Elliott	1,788,017	6,789	211
Magoffin	2,612,541	8,650	188

(Based on the Third Annual Report of the Kentucky State Tax Commission, 1920.)

of the area. Low valuations in a given county represent either an absence of any large urban aggregation or little development of the mineral resource or both. The discrepancies in total valuation do not necessarily represent differences in potentialities, but merely the degree to which possibilities have been realized.

Present assessed valuations are a measure of present conditions, but they do not indicate the relative future possibilities of different counties. Present assessed values in larger part represent the stage of development of a given county. With increasing development of the mineral resources, this portion of the state should become one of the areas of high valuation per square mile.

Many of the mountain counties are at present contributing very little if anything to the state in the form of taxes. For example, from Knox County the total revenue received by the State for the year ending June 30, 1920 (or to be paid), on the assumption that all taxes were paid, was $13,815.71.[3] The State returned to Knox County in money for the support of the common schools in the same year the sum of $29,354.71.[4] The Auditor of Public Accounts reports expenditures in Knott County in 1920 as exceeding receipts by $19,864.88, and in Jackson County by $23,966.54. Such conditions, which are typical of a large fraction of the mountain counties, are, in larger part, temporary and result from poor utilization or a failure to develop resources which are present. A well directed program of development to insure the remedying of this condition would be true economy, even though a considerable initial expense were involved.

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CONCLUSION

The Kentucky Mountains, although settled at a very early date, constitute the largest undeveloped area in the state that holds forth great promise for the future. In no other section of Kentucky is change occurring with more rapidity than in this portion, yet the metamorphosis which the next half century will witness has as yet only begun.

For nearly one hundred years, the mountaineers have been immured in their mountains, shut in on the east by the Pine and Cumberland Mountain barrier and separated from the Blue Grass by the frowning escarpment of the Basal Coal Measure Conglomerate. Amid their mountain surroundings, the mountain people have multiplied in numbers, meanwhile wringing a bare existence from the narrow bottoms and unfriendly slopes. Cut off from the outside world, change penetrated the Mountains slowly or not at all, so that this group of people adhered to pioneer crops and standards of living and perpetuated the customs and expressions of a by-gone day. In the Mountains, up to 1890, lived our "contemporaneous ancestors."

The interesting characteristics of the population, with their eighteenth century customs and peculiarities of speech, have long intrigued the imagination of the outside world to such an extent that it has been difficult to dissociate the mountaineers from a state of retardation. It has come to be accepted almost as a truism that this is a country of little opportunity because of its past performances, whereas the reality is far different. Few equal areas are more highly endowed by nature than the Kentucky Mountains. To the individual who must have level farm land with black prairie soils, who cannot appreciate any area which will not grow bumper crops of corn, the Mountains promise little, but though in an agricultural way the area holds forth slight promise, the great mineral wealth and its possibilities as a reservoir upon which the prairies may draw for lumber, more than make up for agricultural deficiencies.

This area has not as yet been despoiled, except in small part; it still possesses resources of great value. Exploitation has gone farther in agriculture and lumbering than in other directions, yet even there, much remains to be salvaged. Old in

point of time of settlement, the area is young in the stage of development. The problems which confront it are those which face every young and rapidly developing area, the problem of conserving the assets with which the region is endowed—which implies a wise utilization of the resources.

The three major assets of the area are its mineral wealth, its timber resource and its agricultural possibilities. In the utilization of these three, various problems have already arisen which have been stated in the consideration which has been given to each separately, but which may here be summarized appropriately as the problems are interrelated in such a way that each separate problem constitutes a portion of the larger one as to the best use of the entire area.

The unrestricted clearing of steep slopes, made necessary by the pressure of population, has created a rather serious agricultural problem. In this area, over population of the farms is a fact. No net gain in the area of improved farm land can occur; rather a shrinkage of the acreage under the plow must take place. In the face of a steadily increasing population, this means a reduction in standards of living or there must be an outlet for the surplus population. Fortunately, the development of the coal of the area supplies the necessary outlet.

Not only can there be no expansion of the area of improved land, but the acreage under the plow will suffer a decrease as the steeper slopes pass out of use and the clearing of new land no longer offsets the losses by erosion. This situation forecasts a decrease in the ability of the land to support its present population and a decrease in the number and an increase in the size of the farms as agricultural practice shifts to meet the changing conditions. This change is already in progress in many counties and it will eventually spread to all.

Present cropping practice and the economy of the mountain farm must change if agriculture is to adjust itself successfully to the conditions under which it exists. The mountain farmer should, in the future, have not one crop, corn, as at present, but should have several. Practically every mountain farm, even today, has a certain fraction of its surface unfit for anything except a tree crop, another fraction which could be pastured, and a third portion which is permanent plow land. Under present

practice, all three classes are cropped until the first two wash so badly that they can no longer be used. They are then allowed to revert to forest.

The future, however, should see each class of land put to its appropriate use. Under those circumstances, the forest crop would supplement the farm income from other sources; the crops of the level land would afford winter feed for the stock pastured on the slopes. The animal industry would maintain soil fertility and the animal products, as milk and butter, should find ready markets within the area. In many sections, market gardening and the raising of poultry would add to the farm income.

This picture of agricultural conditions of the future is one which could not have been realized in the past and it cannot be brought about immediately in all portions of the area, even today. The mountaineer, under the old conditions, was doing reasonably well, considering all the handicaps under which he labored. Today, however, with the advent of the mines, nearby markets are afforded for the diversified produce of a new system of agriculture. In many localities, such markets already exist and the mountain farmer is favored in these markets by the elimination of high freights which handicap the producer from the outside. The expansion of the industrialization of the area will carry these markets to all portions of the Mountains. If agriculture is to justify itself permanently in the area, such a shift in production must occur.

Agriculture is one of the permanent assets of the area, if practiced wisely, even though not at any given time the major resource. Under appropriate treatment the land is capable of producing indefinitely an undiminished yield. It is, therefore, expedient to make the necessary adjustments to conserve this resource against the time when the exhaustible resources shall have disappeared.

One of the most serious handicaps from which the Mountains suffer is the lack of good roads. This lack makes itself felt in many ways and works a handicap on a great many different classes, but on no class does it fall more heavily than on the farmer, as it determines his farm economy and compels him to follow practices which are poor, both for himself and the community of which he constitutes a portion. Until this condition

is remedied, the shift of agricultural practice which is so highly desirable will be deferred over a large fraction of the area.

Of the original forest resources, not to exceed 12% remains and this is being removed rapidly without any adequate provision being made for restocking the area. Annual growth does not exceed half the "normal cut." In addition, the bulk of the cut is from the relatively concentrated stands of old growth timber, whereas the growth is widely distributed and largely in second growth stands.

This devastation of the forest, in addition to depleting the timber supply, facilitates run off, thereby increasing slope wash with all its attendant evils, including the deposition of sand and silt on hitherto fertile fields. It also changes the regimen of the streams, causing excessive fluctuations in volume with a consequent decrease in the availability of the streams for navigation and the development of power. Summer droughts have also probably increased in severity with the removal of the forest cover.

The Kentucky Mountains is one of the areas in the United States which should be permanent producers of hardwood timber. A high percentage of the land is permanently non-agricultural in character and the surface will never produce anything other than forest products. The present major supply of hardwood lumber for the United States comes from the Mississippi bottom lands. This supply is being depleted rapidly, and the lands being agricultural in character, are rapidly passing under the plow. The country will shortly be forced to seek and obtain practically all its hardwood lumber from non-agricultural areas such as eastern Kentucky. The present affords an excellent opportunity to prepare for that time and to profit by the opportunity which will then exist. The wide variety of valuable hardwoods which will grow in the Mountains and the favorable climatic conditions, which insure rapid tree growth, make this one of the highly favored portions of the United States for the practice of forestry.

To facilitate natural reproduction of the forest, measures should be taken to insure restocking, the protection of the young growth, and the preservation of the more valuable species until the trees are of merchantable size. Forests, once established, should be protected from fire and from damage by stock. Laws

regulating lumbering practice and insuring the protection of the forest should be not only passed but enforced. The addition of a few non-functioning laws to the statute books can do no possible good.

To promote reforestation, taxes on timber should be adjusted so that the raising of a timber crop will yield a profit to the producer. This necessitates a separation of the tax on land and the tax on the timber. The latter should be taxed but once, and that when the crop is harvested. Under no other conditions can individuals afford to undertake reforestation. It is possible, that in view of the time involved in the production of a crop and the normal hazards of production, that even favorable tax laws would be insufficient to tempt the investment of private capital in reforestation enterprises. The reforestation of the mountain slopes is of vital concern to the entire state, though not so realized by a large fraction of the population. Cooperation by the State, at least in experimentation as to the type of trees and the character of the planting which will secure maximum returns, is urgently needed. It is even possible that state owned and operated forests, if their control could be freed from politics, would constitute the solution of the problem, for whereas private capital may hesitate at the long term investment involved, the state can afford to assume the burden.

The problem of the exhaustion of the forest resource is one which cannot be evaded. Large areas are already non-productive and the exhaustion of the resource is in sight. A well considered program of reforestation would mean much to the area. It would improve agricultural conditions, insure an adequate supply of timber for local use and an exportable surplus; it would regulate the regimen of the streams, and improve conditions in various other ways. To obtain maximum effectiveness, the consideration of the problem should not be deferred.

The exploitation of the oil, gas and coal of the Kentucky Mountains, in many cases, has been of such a character that the resource has been dissipated almost criminally.

In a state where domestic consumption of natural gas exceeds production, the waste which has occurred in connection with operations in the gas fields and the use of natural gas in the production of carbon black, seem difficult to justify. Gas

resources are very limited and the life of such a resource is not long, even when properly conserved. Although too late to do more than endeavor to protect the fraction of the resource which remains, even that should be worth while.

In similar fashion, failure to eliminate wastes in exploiting the oil fields has left large quantities of oil in the ground, never to be recovered. Few oil fields are long lived, but it is possible to prolong the life of a field by correct practice, and what is more important, to recover a larger fraction of the oil.

Fortunately, the most important of the mineral resources, coal, is still present in enormous quantities, sufficient to last for many generations in case a practice similar to that which was followed in the oil and gas fields is not repeated. There is every reason to believe that unless some restrictions are imposed on mining operations, that a dissipation of the resource, similar to that in the gas and oil fields, will occur in the coal fields, although the time required to exploit the coal will be much longer.

Much coal is mined very wastefully at the present time, particularly in the smaller mines. Inadequate timbering and poor mining practice ruin many times as much coal as is recovered in many of the mining operations. It may be impracticable to stop completely all the present wasteful practices involved in many of the smaller operations, but it should be possible to formulate and enforce certain minimum requirements.

Coal mining is also introducing a problem which was practically absent a few years ago, the question of sanitary regulations and their enforcement in mining camps. This is a problem which will become increasingly acute with additional development. It is also one the consideration of which cannot be deferred successfully without certain disaster in the form of disease and of physical deterioration of the population of the area. The sooner this problem is attacked the easier will be its solution. As in the case of most of the problems which confront the Mountains, there is no time quite as satisfactory as the present, both from the standpoint of ease of solution and the ultimate good to the area.

Oil, gas and coal, when taken from the ground and marketed, represent wealth removed from the area. Once gone, the Mountains are permanently poorer. Inasmuch as the area must,

with the exhaustion of the mineral wealth, fall back on other resources, those which are exhaustible should be compelled to bear a large portion of the cost of permanent improvements in the area. It is too late to levy on oil and gas to any great extent, but coal still remains in enormous quantity. Just taxes imposed on coal at the point of production should furnish an increasing amount of revenue which would insure that some of the wealth produced would remain in the area. If the proper measures are taken, the area will not, with the exhaustion of the coal, exhibit the characteristic appearance which exists in an oil or gas field with the collapse of the boom.

Eastern Kentucky developed late, which allows the region to profit by the lessons of areas whose resources were exploited and dissipated at an earlier date. Upon the ability to benefit by the dearly purchased experience of others, will depend the future of the area. A region of enormous mineral wealth, with a considerable remnant of the original forest resource and some land which can be kept permanently under agricultural use, there is no reason why the Mountains should not have a promising future.

The people are essentially of American stock and have all those delightful characteristics which have made them live in story. Hospitable to a fault, kindly, courteous and obliging, they have been unfortunate in the surroundings in which they have lived. The Mountains are beautiful and it is not strange that the mountaineer has a strong attachment to the home land, but living conditions have been so hard that deterioration was inevitable. The future, with contact with the outside assured and with fresh avenues of opportunity opened, should be much brighter.

The present stage in the developmental history of the Mountains is critical. Action too long deferred will handicap the area permanently. The State should lose no time in so regulating the development of the resources that the best interests of the Mountains are served. The State should not consider the private gain of a few individuals more important than the welfare of the entire mountain community. An intelligent, well considered program of development will insure prosperity; unregulated exploitation will convert the area into a liability to the entire state.

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INDEX.

Agriculture, 60-84; future of, 83-84.
Alfalfa 74
Alluvial deposits 11
Animal industries 78-82
Areal extent of mountains 3

Barley 73
Bituminous sandstone 132
Brick 133-136
Bridges 106
Buckwheat 73

Cattle 79
Cereal production 62-73
Cities: character of, 141; classification of, 141-142; location of, 139; plans of, 140; Ashland, 143-145; Barbourville, 150; Benham, 94; Catlettsburg, 143-145; Corbin, 149; Fleming, 150; Harlan, 150; Hazard, 147-148; Hellier, 150; Jackson, 150; Jenkins, 94, 148; London, 150; Louisa, 150; Lynch 94; McRoberts, 150; Middlesboro, 145-147; Olive Hill, 150; Paintsville, 150; Pikeville, 150; Pineville, 149-150; Prestonsburg, 150; Williamsburg, 150.
Clay, 132-136; flint, 132; floodplain, 133; plastic, 132; products, 135; residual, 136.
Climate 62
Coal 121-127
Corn 62-68
Counties: origin of, 3-6; size of, 6-7.
Creek bottom settlements: areal extent, 23; living conditions, 25-27; roads, 25; topography, 23; soils, 25; vegetation, 25.
Crop production: character of, 61; relation to climate, 62; relation to soils and topography, 61.
Cumberland mountain 3

Drainage 37

Elevation 8, 10

Farms: number of, 49-51; improved land per farm, 53-56; size, 51-53; value, 57-60.
Farm machinery 91
Fences 87
Fords 106-107
Forest products 42
Frosts 62
Fruits 77-78

Gas 130-132

Hay and forage crops 74-76
Highways and transportation 103-120
Hogs 80
Horses 81-82
Houses: in mining camps, 96-97, 99; in rural areas, 23-26, 86-90; in urban centers, 147 and 151.
Hydroelectric power 137

Iron ores 137

Land: ownership of, 100-101; unimproved, 31-47.
Living conditions: in mining communities, 94-101; in rural districts, 85-93.
Lumbering 39-41

Mails 90
Manufactures 144-148
Mills 91
Mineral wealth and the mineral industries: bituminous sandstones, 132; coal, 121-127; clays, 132-136; gas, 130-132; iron ores, 137; oil, 127-130; sands, 136; water, 137.
Mules 81-82

Negroes 159-161
Nuts 77-78

Oats 69-70
Oil 127-130
Outbuildings 86

Physical features 8
Pine Mountain 3
Population, 153-161; character of, 158-159; distribu-

tion of, 153-154; nativity of, 157-158 and 160; changes in distribution, 156-157; negroes, 159-161; urban and rural, 153-155.
Potatoes 77
Poultry 82
Railroads, 113-120; in early settlement, 113; construction of, 114-117; distribution of, 118-120.

Rainfall 62
Reforestation 45-47
Ridge top settlements: areal extent, 16; living conditions, 19-21; roads, 21; rock formations and topography, 17; vegetation, 19.
Rivers 10
River navigation, 110, 113; early, 110-111; present day, 111-113.
Roads, 103-110; character of, 105-108; mileage of, 103; road mesh, 104.
Rock houses 88
Rye 73

Sands 136
Sanitary conditions: in mining camps, 97; in rural areas, 92.
Saw mills 41-42
Schools: in mining camps, 97, 99; rural schools, 92; settlement schools, 92-93.
Settlement, early routes of 5
Sheep 81
Small grains 68
Snow 62
Soils 17, 19, 25
Sorghum 73
Space relationships 3-7
Spinning wheels 88
Subdivisions of the mountains, 13-28; basis for, 13-14; names of subdivisions, 14.

Terraces 11
Tile 133
Timber, 38-47; character of virgin growth, 38-39; old field growths, 39; ownership of, 42-43; scenic value of, 45.
Tobacco 77

Urban development, 142; future of, 151-152.

Valleys, character of 11
Vegetables 76

Washing 88
Water 137
Water supply 90-91
Wealth, 161-163; distribution of, 162.
Wheat 71-72
Wilderness Road 4
Winds 62